DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF:

Foreword

To Members and Friends of the Huntsville Center:

This is a story of the dedicated efforts of the men and women of a highly technical, public service engineering organization, the U.S. Army Engineering and Support Center, Huntsville, Ala. It is a story about a knowledge-based organization applying its technical capabilities, customer service attitude, and business orientation for the benefit of the American people. The professional, hard working employees of the Huntsville Center have made the organization a model for other Federal agencies to emulate as government reinvents itself for the Twenty-First Century. These employees have stayed on the cutting edge of innovation in specialized engineering services, project management, contract management, construction management, public safety, and public involvement. Therefore, this historical update details an intense drive for continuous improvement and defines in many ways the true definition of "quality" in the Federal Government.

Sincerely,

Walter J. Cunningham
Commander
U.S. Army Engineering and
Support Center, Huntsville

Preface

I was first introduced to the Engineering and Support Center, Huntsville in 1996, when I was contracted by the University of Alabama in Huntsville to edit and complete an unfinished historical manuscript of the U.S. Army Corps of Engineers, Huntsville Division covering the dates 1988-1992. Since that time, through the many twists and turns my research has taken, the Huntsville Center has never ceased to amaze me. The breadth of technical expertise required for its varying and complex programs is truly impressive. Since its origin in 1967, the Center has been involved in some of the most important design and construction programs facing the U.S. military. Equally impressive for anyone familiar with the military is the reimbursable nature of the Center's programs. Although organized as a military unit, the Center functions more like a business than the typical government agency. In essence, the Center captures the best of both worlds: the discipline and camaraderie of the military, yet the cost efficiency and customer care of a business. This powerful combination has made the Center particularly effective in an era of downsizing and budget reductions.

Picking up where the previous history leaves off, this current history is a continuation of the many ongoing stories about the Center's relocation, military downsizing, chemical demilitarization facilities, growth of the ordnance program, and other themes that were part of the history from 1988-1992. For much of the present history, I relied on the research required for the preceding volume for background descriptions. There are, however, several completely new sections: the many new events, the adoption of the Army Performance Improvement Criteria, the story of automation at Huntsville Center, and several programs which had their origin since

1993. Realizing that the current history will be the primary volume distributed during the year 2000, I have tried to make the story as complete as possible, providing a larger summary of preceding events and histories, and fleshing out the descriptions of several programs of interest. It was a chief goal to try to move past dry descriptions of technical programs to include personal stories and numerous examples. Only time will tell whether I have been successful in writing a history that, though narrowly focused, is nevertheless interesting.

I would like to acknowledge and extend my appreciation to the employees of the Huntsville Center for patiently answering my questions and taking time out of their busy schedules to point me in the right direction. Without them, completing this history would have been impossible. I want to particularly thank the Public Affairs Office for giving me advice, helping me with research, and for the opportunity to once again work on a history of this fine organization. Most of all, I want to thank my loving wife, Christy, for tolerating my putting in long hours on this project.

Damon Manders

October 1998

I.

Introduction:

The Origins of the Huntsville Center

When the Engineering and Support Center, Huntsville came into being in 1967, it was little more than a name – U.S. Army Corps of Engineers, NIKE X Division – with no assigned personnel or home station, but with one specialized mission: supporting the newly created SENTINEL missile defense program. Since that time, it has found a home, grown in strength, expanded its expertise, and altered its mission to serve the Corps of Engineers and U.S. military in many unique ways. The history of this organization, carefully traced by James Kitchens, Louise Heidish, Louis Torres, and Damon Manders in the organizational history and subsequent updates, is at times complicated but ever essential to understanding the role the Center has played in the history of the Corps of Engineers and the nation.[1]

The Huntsville Center grew out of the single mission of supporting the SENTINEL missile program, in which interceptor missiles would be used to destroy or incapacitate incoming ballistic missiles. First announced by Secretary of Defense Robert McNamara on September 18, 1967, SENTINEL was an extension of the NIKE missile program of the 1950s. Despite encouraging technological advances, including the development of radars powerful enough to detect incoming missiles, the concept of ballistic missile defense (BMD) had been in decline until 1967, when President Lyndon Johnson decided to use the technology developed for the NIKE X program to build a limited BMD system, SENTINEL. The Army would construct and man 17 radar and launch sites across the country and in the Pacific. Because the facilities had to be impervious to foreign missile attack, they required advanced design and engineering. Since

1958, the U.S. Army Corps of Engineers had supported the design of several test facilities for the NIKE program, but because the SENTINEL program was much larger, both in terms of cost and geography, it would require an organization that could work in several Corps of Engineers geographic districts and had the freedom to concentrate on the logistics of the program. The Office of the Chief of Engineers decided that this important mission required a new division that would be wholly devoted to its needs.[2]

On Oct. 9, 1967, the Office of the Chief of Engineers formally organized the new agency, afterwards named U.S. Army Corps of Engineers, Huntsville Division because it would be located in Huntsville, Alabama. As the home of the United States' first missile programs, Huntsville was an ideal location for the Division to enable it to better coordinate with missile agencies in designing and building launch and radar facilities. Initially, the Division had no personnel, no home, and no commander. These problems were all quickly remedied. Before the end of the year, Col. R.P. Young assumed command of the infant organization, experienced engineers were pulled from the Mobile and Canaveral Districts and the Office of the Chief of Engineers, and the organization found temporary residence on Meridian Street in Huntsville. It would be another year and a half before the organization moved to a more permanent facility in Cummings Research Park shared with the SENTINEL System Command – a building which it would occupy for the next two and a half decades.[3]

Design work for SENTINEL proceeded quickly. Huntsville Division began developing plans for the missile site control building and the perimeter acquisition radar building. A construction firm the Division contracted had actually started laying the foundation for a radar facility located near Boston, Massachusetts, when the Army suspended the program. The location of the facilities so close to civilians caused some alarm, and opposition grew in the Boston area. Local meetings held by the Corps of Engineers to diffuse the situation sparked extensive debate in Congress, and President Richard Nixon agreed to form a committee to

evaluate the necessity of the program. After several months of investigation, the committee reported to Nixon, and he announced that the program would be relocated near Midwestern ICBM fields and redirected to defend the U.S. strategic forces and the "deterrent system." Such a missile defense program would be a "safeguard" against Chinese and Soviet aggression. Picking up on these remarks, the press began to call the program SAFEGUARD, and the Army accepted this new name in 1969. Despite continued Congressional debate, the program was eventually approved and funded, design and construction of facilities at Malstrom, Montana, and Grand Forks, North Dakota, proceeded, and Huntsville Division's employment grew substantially.[4]

After several years of progress, work on SAFEGUARD began to slow in 1972 when the Senate approved the Strategic Arms Limitation Talks (SALT) treaty, which limited the number of BMD sites. Although construction and testing the Grand Forks site continued for several years, the additional research this required was not as labor intensive, and Huntsville Division personnel gradually became involved in several new missions. Because the Division had excelled at procuring equipment and furniture for the SENTINEL/SAFEGUARD facilities, the Postal Service and later the governments of Saudi Arabia and Jordan requested help in procuring equipment for new facilities. Procurement experience also helped Huntsville become involved in creating savings through better contracting.

Experience in designing blast resistant facilities earned the Division several projects. Beginning in 1972, NASA requested that Huntsville Division help design test facilities at the Marshall Space Flight Center in Huntsville, Alabama, and at the Michoud Assembly Facility in Louisiana. In 1973, the Army Materiel Command requested support for the Munitions Production Base Support Construction Program, which entailed designing and updating buildings used for development and production of explosives and munitions. Then in 1976, Huntsville Division became involved in the first of several energy programs: designing processes for converting coal to low emission fuels for the Energy Research and Development Administration.

While these missions appear very dissimilar, they all had certain characteristics: they were national in scope, large in scale, and required specialized technical expertise. These types of missions were uniquely suited for Huntsville Division, and the Division repeatedly proved its expertise in handling them.[5]

By the early 1980s, Huntsville Division had changed significantly. As historian Louise Heidish explains, "The Division changed from a design and construction organization, with a few missions dominated by the ballistic defense program, to a diversified high technology engineering and design and procurement organization." The Office of the Chief of Engineers was delegating missions to other organizations so it could focus on policy, guidance, and review, and this resulted in many new missions being assigned to the Division. Work on ballistic missile defense continued with the Low-Altitude Air Defense System (LOADS), and support continued for NASA, the Munitions Production Base Support program, and a variety of energy conservation programs. However, more than 50 percent of the new projects were related to military readiness: updating Corps of Engineers guide specifications, creating ready-made plans for the Army Facilities Components System, automating engineering forms and contracting processes, modernizing ranges, and directing and administering training for other Corps organizations. The Division also saw the origin of two of its most complex and long-lasting programs: performing site investigations and criteria definition of environmental cleanup sites for the Army Pollution Abatement Program and designing facilities to destroy chemical weapons for the Chemical Stockpile Disposal Program.[6]

[Figure 1: Historical Workload Trends]

Such a variety of missions required a different organization and structure than for its original mission. As a result, the Division reorganized into several major divisions or

directorates: Engineering, Construction Evaluation and Management, and Procurement and Supply. Later, Training and System Engineering Directorates were added to head up these special missions. There were also a variety of supporting offices, including a Safety Office, Security Office, Resource Management Office, Information Management Office, Personnel (later Human Resources) Office, Administrative Office, Office of Counsel, and a Public Affairs Office. The result was an enlarged and much more effective Huntsville Division.[7]

During the eighties, Huntsville Division became more and more associated with highly technical programs, and its technical expertise was a frequently sought commodity. Col. John Poteat, Division Commander from 1980-1984, wrote on the eve of his retirement, "It is vital for the success of the Corps to have a specialized advanced technical operating division like Huntsville ... to serve as a high technology center of expertise for a variety of missions." He was essentially recognizing that technical expertise had been the creed at Huntsville for many years.[8]

By 1987, Huntsville had been recognized as a Center of Expertise in more than 13 programs. When President Ronald Reagan envisioned lasers shooting missiles out of the sky, the Strategic Defense Initiative, the same experts who worked on the SENTRY/LOADS missile defense program were assigned to design facilities for the experimental lasers. When Senator Patrick Moynihan initiated research into a magnetically levitated train (MAGLEV), Huntsville Division received the call to help with designs. When organizations around the world sought the most advanced technology in Intrusion Detection Systems, Huntsville personnel became the leading experts in this technology. Many other highly technical programs occupied the Division's time, including the programs that had become its mainstay: Munitions Production Base Support, NASA support, Utility Monitoring and Control Systems, the Army Pollution Abatement Program (later the Defense Environmental Restoration Program or DERP), Chemical Demilitarization, and development of automated engineering processes. And the Corps continued to rely on Huntsville for managing training programs.[9]

[Figure 2: MCX/TCX List]

As Huntsville Division moved from the eighties to the nineties, it faced many of the same challenges as the rest of the military. The Department of Defense went through a process of reorganization and downsizing following the end of the Cold War in 1989, including the Base Closure and Realignment Acts. The Corps of Engineers also underwent reorganization during the same period. These had both direct and indirect impacts on Huntsville Division. The Division made some internal realignments to make itself more cost efficient, though the major impact was on morale, which the Division largely overcame through better information, competitive programs like the Army Communities of Excellence, and greater employee support: training, needs accommodation, and improved quality of life.[10]

Indirectly, however, Huntsville faced increased workloads as downsized military commands could no longer support important functions such as environmental cleanup, energy contracting, and modernization/standardization of facilities. The Division continued to support a comprehensive array of missions, from designing or updating facilities for the U.S. Army Space and Strategic Defense Command to procurement missions for the Office of the Surgeon General to energy conservation contracting to developing standardized designs for military facilities. But the core of the Division's mission in the mid 1990s focused on environmental issues, in which ordnance removal was playing an increasing role, and the Chemical Demilitarization program, which had finally reached the point of construction. Also noteworthy was Huntsville's role in automating many engineering and contracting processes and the beginning of its involvement as a test site for the Corps of Engineers Financial Management System.[11]

By 1994, many of the long expected changes were beginning to filter down from the Department of Defense to the Corps and finally to Huntsville Division. Though there were still

fears of closure, the changes were actually very positive, helping the Division focus on its missions and improve its service. The change in name to the U.S. Army Engineering and Support Center, Huntsville in 1995 was merely a recognition of the non-geographic role the Division had played for several decades, while the organizational changes that followed generally reflected the activities towards which its employees naturally gravitated. Perhaps the greatest change was one in attitude. Col. Robert D. Brown, commander until 1995, had noted a few months prior to his retirement that "Huntsville Division is in for a bit of a belt-tightening as part of the government-wide drive to streamline operations." His prediction has largely proven true. Huntsville employees have had to look for new ways of doing work in order to better tap their knowledge and energy. Part of this effort included the adoption of the Army Performance Improvement Criteria (APIC), a set of quality improvement standards based on the Malcolm Baldrige national business standards. Center leaders took specific steps to improve leadership, provide better analysis and planning, and meet customer needs. The Center conducted several studies, implemented team structures to better utilize employee talent, initiated product lines that focused on its missions, increased automation, and in general became leaner and more efficient.[12]

The result of the Center's streamlining efforts was reinvention of itself as the low-cost source of engineering expertise for the military's most technical programs. The Center continued to support BMD, Production Base Support, IDS, and Force Modernization. As a center of expertise for ordnance removal, the Center became deeply involved, not just in ordnance removal, but in establishing policies and procedures for ordnance programs. Pioneering work in automating engineering processes now paid off with high respect as an innovator in military computing programs. Chemical Demilitarization – long an important program for the Center – now entered a critical phase as construction of facilities at Anniston, Alabama, and Umatilla, Oregon, proceeded under supervision of Huntsville personnel. And by developing innovative contracting methods to conserve energy, the Center saved military installations millions of

dollars in energy costs without the extensive overhead of the past. By 1997, Col. Walter Cunningham, commander since 1995, noted that Huntsville's growth in the midst of downsizing was proof that "the Huntsville Center is a leader in the revolution of the Army's business affairs." [13]

From simple beginnings, Huntsville Center had grown to be a model organization providing specialized engineering and safety, program and project management, contracting, and construction expertise over a wide variety of programs, including some of the most vital work that involved the Corps of Engineers. It had proven itself an asset to the U.S. military in its efforts to provide us with a safer world. The initiative, quality, and cost-effectiveness displayed by the Center in the programs discussed at length in the following pages demonstrates its success in facing these challenging times.

II.

An Era of Changes

After 1993, Huntsville Center faced a number of changes, from relocation to reorganization.[1] Though the Center continued to support the same missions, its appearance and business methods altered significantly. Most of these changes had long been foreseen, yet still caused challenges to the morale and performance of Center personnel. A move to new facilities had been planned for more than two years, but many adjustments had to be made to the plan prior to the move. Changes in command and personnel were routine but always required building new relationships. News of reorganization both within the Corps of Engineers and the Department of Defense had been cause of concern since 1989, and though the resulting changes were not harmful, they required some adjustments in how the Center functioned and how it viewed itself.

A new building

One of the first major changes after 1993 was relocation to a new building. The Center had been contemplating changing locations within Huntsville for some time. Although the office on Wynn Drive in Cummings Research Park offered many advantages, such as proximity to the University of Alabama in Huntsville and leading private and government organizations researching missile and related technologies, it was far too small for the current staff. When the Center first occupied the building, the organization had fewer than four hundred employees. With nearly six hundred in 1993, employees were forced to work out of offices located

throughout the Huntsville area. The U.S. Army Space and Strategic Defense Command (USASSDC), which shared the building on Wynn, supported the Center's move because it, too, had employees at multiple locations and wanted to relocate its employees to a single office. Since the original impetus for staying in Cummings Park – easy access to USASSDC – grew less crucial as the Center became less involved with missile programs, Col. Phillip Hall, the Center's commander from 1990-1992, and the executive staff at Huntsville decided to begin the search for new facilities.[2]

In 1992, Colonel Hall and executive officer Lt. Col. Hal Cranor formed the Division's Urgent Moving Project (DUMP) committee, which was chaired by Bob Joslin and included representatives from the offices of Resource Management, Information Management, and Engineering (Civil-Structures). The committee was to coordinate with the General Services Administration (GSA) to find a new location, help with interior building designs, create a moving plan, and coordinate the move in a way that reduced downtime. The Center's primary requirements for a new building were that it have more than 100,000 square feet and be located in the Research Park area, placing it near the Center's warehouse, the Redstone Arsenal, USASSDC, and several major contractors. After reviewing a range of buildings that met these criteria, the DUMP committee announced in 1993 that they had narrowed the proposed sites down to four: buildings owned by SCI, Chrysler Corporation, BDM, and an undeveloped site near Madison Square Mall in Huntsville. Unfortunately, the existing buildings were either too large, too small, or would require extensive renovation. Then in last minute negotiations during January 1994, Chrysler withdrew its bid, which was replaced by a bid for an empty lot near the corner of University and Wynn Drive, just north of the building the Center currently occupied. After a lengthy analysis, the committee decided that building a new facility would be less expensive than renovation, so they arranged with GSA to construct a new building at the Wynn location.[3]

The groundbreaking for the new building on Wynn occurred October 28, 1993, with construction scheduled to be complete by June 6, 1994. According to plans, the building would have three stories, 123,000 square feet, and cost $3.2 million. The move was scheduled to occur from July 31 to August 21, with files and major hardware being moved earlier and the majority of employees moving in stages during the final week – one office per day. Personnel in each directorate and office would pack their belongings and supplies in carefully marked boxes, then get the day off on their appointed move day while a contractor coordinated with Move Project Manager Ron Sketo and selected teams to relocate the boxes and computers. Because the building contractor did not finish the building as scheduled, the move dates were delayed, first to August 1, then November 6, November 15, November 26, and finally to sometime in December. Colonel Brown remarked ironically that "now we're on the 'customer' end of the engineer/building process" because the Corps had no construction or review responsibilities and had to accept construction delays. Nevertheless, a push was made to complete the move by the end of the year, with relocation of personnel taking place from December 16 through December 30. Once the move was complete, the old building still had to be completely vacated and cleaned, a process that was not completed until January 18, 1995. [4]

A tremendous team effort among all Center offices made the move a success. Personnel from the Architecture Branch of the Directorate of Engineering helped draw up floor plans and pick out equipment such as chairs and desks based on their color and ergonomics. The Office of Security and Law Enforcement supported the installation and placement of security systems. The Directorate of Information Management provided and installed the computers and local area network (LAN). The Contracting Directorate, Audit Office, and Office of Counsel reviewed contracts and agreements. The Directorate of Resource Management helped with paying the bills and arranging the move. The Logistics Office helped prepare for the move through storage, packing, distribution, and the receipt and restocking of supplies. Employees and managers from

each office and directorate did their part in contributing time and ideas to make the new building home, while the executive staff reviewed plans and made the final decisions. Sketo, who acted as a liaison between the GSA, the executive committee, and the rest of the Center, coordinated all the move activities, making sure plans and other documents were delivered and concerns expressed. But as the day of the move approached, every employee contributed by packing, pitching in, and working together to make the move a success.[5]

[Figure 3: The New Building]

On March 28, 1995, just long enough after the move to finish settling in and completing final preparations, Huntsville Center employees celebrated their new home with family and former employees at a ribbon cutting and open house. It was a way of sending a clear signal to employees that the move was over, and it was time to get back to work. Like any new house, there were still unexpected problems and issues that had to be resolved. For example, several employees became concerned soon after the move about the floor vibrating in certain locations. GSA specifications required floor loading to be a minimum of 50 pounds/foot, but in reality, this would not support concentrated areas of large, heavy file cabinets. After the Center brought this to the attention of GSA, the builder inspected the loading and found it to be safe. On another occasion, the building started leaking, requiring additional repairs. Then, on the first tornado drill after the move, it was discovered that not all employees could fit into the inner building hall. The Center's safety engineers had to locate some additional space and redesign emergency plans. Some of these problems may have been avoided had the Center been able to review the work, but this would have delayed moving, and for many, the cost was not worth it. Despite these occurrences, employees found the new building spacious, attractive, and adequate for their needs, but equally important, nearly all employees were finally in a single building. [6]

Leadership changes

Another change occurring from 1993-1997 came with a new commander. Col. Robert D. (Duncan) Brown had been the commander since July 1992, and had the opportunity to oversee the growth of several projects and the introduction of some major improvements at Huntsville Center. The ordnance removal program had grown significantly, Huntsville's role in Chemical Demilitarization shifted from primarily one of design to one which included construction oversight, and the Center was selected as a test site for the new Corps Engineering Financial Management System (CEFMS) software. He was commander during the move to the new building and witnessed the establishment of e-mail. In the spring of 1995, after thirty years of military service, Brown disclosed his plans to retire, and Chief Engineer Lt. Gen. Arthur Williams named Deputy Commander Col. Walter J. Cunningham to be the thirteenth commander of the Huntsville Center (see Appendix A for commander biographies).[7]

[Figure 4: Col. Robert D. Brown]

The change of command ceremony was held on the afternoon of June 8, 1995 in front of the new building. After Colonel Cunningham accepted the Corps of Engineers flag from General Williams as a symbol of command, Williams spoke of the necessity of proactive leadership, commitment to the unit, and commitment to customer satisfaction. Colonel Cunningham seems to have taken these words to heart. Although such ceremonies are routine, this change of command had a certain significance. Noting in his address that Brown once served as his battalion commander, Cunningham said, "We were the hollowest part of the hollow Army back in 1979 and 1980.... He kept the faith in a very tough time." Applying the lessons he had learned

as deputy commander under Brown, Cunningham continued to bring an energy and vision to the job that were well-suited for that era of downsizing. His progressive leadership toward greater cost-efficiency and improved performance has become well known among Huntsville employees.[8]

[Figure 5: Col. Walter J. Cunningham]

Surrounding Colonel Brown's retirement, there were several other retirements and routine transfers. The result was that the organization was significantly different than it had been before 1993. In training, Emmit Creekmore retired in 1995, to be replaced by Gary Andrew. After many years of service, Henry Everitt retired in 1994 as the Deputy Commander of Programs and Technical Management, a position that was subsequently occupied by William Thornton from 1994-1995, by Charles Hess from 1995-1996, and finally by Dwight Burns. Leo Carden, the chief of Program and Project Management Directorate, also retired, as did Blake Baughman, the chief counsel. In January 1995, Robert DiMichele replaced the outgoing Kenneth Crawford as chief of the Public Affairs Office. Paul Linderman, the longtime director of Information Management, retired in 1996 and was replaced by John Samuelson. In March 1996, James Cox replaced Charles Hess as the chief of Chemical Demilitarization Construction, and later that year Chuck Galloway was selected as resident engineer for the Umatilla resident office. There were also several Military Deputy Commanders from 1993 to 1997: Col. Leo E. Norton served until 1994 when replaced by Colonel Cunningham. When Cunningham took command in 1995, Lt. Col. Robert Hatton began his term, which lasted until 1996 when Lt. Col. James Roy became deputy commander. In 1997, Lt. Col. Robert Christian inherited the position. A large influx of new employees also occurred as many of the rank and file also retired,

including many who had been with the Center for several years. Although the faces changed, the Center's strength remained fairly consistent (see Appendix B for strength reports).[9]

A new name

By far the largest changes from 1993-1997, and those that caused the most anxiety, were related to the reorganization of the Corps of Engineers. Efforts to downsize the military had been ongoing since 1989. As late as 1997, the Department of Defense planned to reduce its force by some 150,000, in part by relying more on private sector companies to provide maintenance and other non-technical jobs. In the Corps of Engineers, there would be reductions of 4,200 by 1999. Much of this could be accomplished by attrition and by restructuring and reducing staff, and by 1995 the Corps had eliminated several levels of project review. However, the House Appropriations Committee included language in the initial draft of the 1996 Energy and Water Development Appropriation requiring the Corps to develop a plan to reduce the number of division offices by no less than four. Signed by President William Clinton at the end of 1995, the act directed the Secretary of the Army to submit a reorganization plan within sixty days. The uncertainties of downsizing after 1993 raised some employee concern, but Colonels Brown and Cunningham tried to present reorganization as an opportunity for Huntsville to push forward while Headquarters was preoccupied with making the requested changes. There was still some anxiety, but they dispelled many worries by expediting the transmission of news, controlling rumors, and holding town meetings whenever an opportunity arose, such as General Williams' visit in March 1995.[10]

[Illustration 6: New Division Structure]

Huntsville Center continued to operate well under the pressure, but change finally came. On August 9, 1995, a memorandum from Dr. John H. Zirschky, the acting Assistant Secretary of the Army for Civil Works, raised the possibility that, in response to the Energy and Water Development Appropriation, the Corps would require "either the conversion of Huntsville Division from a MSC (major subordinate command) to an engineering center or other entity, or the elimination of the Huntsville Division." On the August 14th, Colonel Cunningham held meetings with employees throughout the day, in which he stressed that closing the Division was unlikely. This appeared to be accurate when the Headquarters, U.S. Army Corps of Engineers requested input for a new name in October. The name selected by Headquarters was then forwarded to Zirschky, and on November 3, Secretary of the Army Togo D. West officially approved the redesignation of Huntsville Division as the U.S. Army Engineering and Support Center, Huntsville (CEHNC). Although changing names may have indicated to some that the role the Division had played was coming to an end, in fact the Center would continue to operate as it had, while the new name brought several benefits. Aside from the fact that it more closely reflected the work Huntsville actually did, the designation "Center" suggested that Huntsville was no longer part of the Corps structure that was undergoing revision. As Colonel Cunningham explained, "Division implied a command and control function that we did not have. At this time when the government is concerned about layering and too much overhead, being associated with that overhead was not in our long-term best interest."[11]

Organizational changes

Initially, there were no major organizational changes internal to the Center to correspond with the change in name. There had been some minor changes over the years. In 1994, the Safety Division (formerly the Systems Safety Branch) moved from the Directorate of

Engineering to Program and Project Management, where the new Mandatory Center of Expertise in Ordnance and Explosive Waste – also a primary focus of Safety – was located. The Small and Disadvantaged Business Utilization Office came under the auspices of the Contracting Directorate the same year. Then, because Huntsville gained the additional responsibility of overseeing construction on the remaining Chemical Demilitarization program, the Construction office was expanded significantly after 1994 and became a separate directorate in 1995. By 1995, Ordnance and Explosives also became a separate directorate. (See Appendix C for a complete listing and description of Huntsville Center offices).[12]

Eventually, however, Center leaders recognized the need to streamline processes to avoid the need for further cuts or changes in mission, and reorganization within the Department of the Army and the Corps of Engineers also resulted in significant changes. One of the first organizational changes occurred in 1995, when the Center restructured its offices and directorates to improve customer service. Before 1994, the Center was divided into technical staff, who reported to the deputy commanders, and an advisory and administrative staff, who reported directly to the commander and executive office. The new organization placed all directorates providing external customer focus under the civilian deputy for Program and Technical Management, while those offices and directorates that primarily supported internal customers would report to the military deputy. Unique within the Corps of Engineers, this organization aligned Center directorates more closely with customer needs while eliminating management layers and improving efficiency.[13]

[Figure 7: Huntsville Center Organizational Chart, 1993]

[Figure 8: Huntsville Center Organizational Chart, 1997]

Another organizational shift was the result of an Army plan to consolidate personnel offices into ten regional Civilian Personnel Operations Centers. As of March 1, 1997, Huntsville Center's Human Resources Office was consolidated into a centralized personnel services office at Redstone Arsenal near Huntsville. Originally, a three-man personnel staff would have remained at the Center to support the organization internally, but later that year, the Army combined the remaining personnel spaces with Redstone's Civilian Personnel Advisory Center. Under this plan, Huntsville Center would continue to receive many of the same personnel services as before – placement, training, records maintenance, counseling, and so forth – but from Redstone employees instead of personnel advisors located at Huntsville Center. In reality, managers assumed much greater responsibility for many Human Resources functions, including training, evaluation, and position classification. By the end of 1997, the Center was in the middle of forging a servicing agreement with the Redstone personnel offices to pursue its Human Resources support.[14]

A third change in Huntsville Center's structure was the movement of the Training Directorate to the Headquarters, U.S. Army Corps of Engineers (HQUSACE). The Corps of Engineers Training Management Division had originally been attached to the Office of the Chief of Engineers, but following a decision to separate training operations and policy, the training organization was moved to Huntsville Center in 1978. At that time, the new Directorate only had 12 people, but it quickly expanded. Occupying at first the Cummings Research Park building, the Training Directorate offered its first course in September 1978. By the following year, it offered 106 courses, many with several sessions per year taught at locations throughout the world. In August 1979, after rapid growth, the Directorate moved into its own facility on North Memorial Parkway in Huntsville. The Training Directorate continued to expand its course offerings, including both traditional classroom instruction through Proponent Sponsored Engineer Corps Training (PROSPECT) and exportable video and audio training through Corps of

Engineers Nontraditional System Training (CONTRAST). The number of sessions offered at Corps facilities grew from 241 in 1982 to a peak of 439 in 1986. The number of students reached by these programs ranged from 7,949 in 1982 to 14,288 in 1992. Because of this expansion, the Corps designed, built, and furnished a new facility, the Tom Bevill Center, on the campus of the University of Alabama in Huntsville (UAH) for use by the Training Directorate. This center opened in 1988.[15]

Although the number of courses and students remained high – 187 courses and 13,500 trained in 1995 – on September 9, 1996 HQUSACE resumed control of the Training Directorate, which it renamed the U.S. Army Corps of Engineers Professional Development Support Center (PDSC). According to Maj. Gen. Pat M. Stevens, acting HQUSACE commander, the transfer of responsibility assisted in the execution of a "consistent corporate direction" because of improved access to Headquarters. Oversight of training and development fell under the purview of the Directorate of Human Resources, which was already responsible for all other Corps training. The PDSC continued to occupy the Bevill Center as a tenant of UAH and reported directly to the Director of Human Resources at Headquarters. In a 1997 memorandum of agreement, Huntsville agreed to provide logistical, contracting, information management, and administrative support as it had previously in return for reimbursement from the PDSC.[16]

Finally, there were several unofficial changes in organization that resulted from the many efforts of Huntsville Center to streamline its business processes. Although there had always been attempts at improving quality, an increased awareness of downsizing brought a push to constantly improve the organization after 1993. These efforts come under the umbrella of Total Quality Management (TQM), a set of business principles that one Huntsville Bulletin column-writer defined as "an on-going, never-ending process of coming up with ways to do our mission better, faster, and cheaper." As applied at Huntsville Center, TQM included several unofficial organizations – groups and teams focused on improving quality and business processes (see

Chapter Three). Perhaps the most encompassing way that Huntsville Center addressed quality management was to adopt the Army Performance Improvement Criteria (APIC), a set of criteria replacing Army Communities of Excellence (ACOE) submissions that helped assess the health of the organization. Based on the nationally recognized Malcolm Baldrige assessment criteria for businesses, APIC helped the Center consistently apply its business principles by establishing business strategies, managing and assessing performance, and integrating customer performance requirements. By consistently applying processes and principles such as TQM, the Center improved business management through teaming, increased supervisor/employee ratios, and reduced its overhead.[17]

A new vision

Huntsville Center's streamlining efforts were largely successful, and in many ways would become the model for the Corps under the vision of Lt. Gen. Joe Ballard, the new Chief of Engineers. At a town hall meeting in Huntsville on October 21, 1997, General Ballard praised Huntsville Center's quality program, though he also stressed that continued efforts to improve quality were necessary to meet his goals of revolutionizing effectiveness, seeking growth opportunities, and investing in people. "We must reinvent ourselves to meet emerging customer needs," he said. Although some Corps districts viewed the Center as a "poacher" that stole work from Corps geographic elements, within its unique mission the Center exemplified the whole team concept – all Corps organizations working together. Nevertheless, Ballard saw Huntsville's progress as the Corps' best step towards increased productivity, and he stressed his desire for Center employees to continue reaching towards his goal.[18]

The Huntsville Center had undergone many changes since 1993. It had relocated to a new building, changed commanders, faced downsizing, changed names, reorganized its offices,

and refocused its vision for the future. The Center had faced many challenges, and, thanks to the positive attitude of its employees, it came out stronger. No matter how much they were affected, the people making up the Center largely preferred to see change as a challenge to increase quality rather than as some drastic event. In an open letter on his retirement, Deputy Division Commander Henry Everitt mused, "All around us there are those with shrinking budgets, cutbacks, layoffs, and suffering from low morale and low productivity. Our problems are nice problems," he said, such as "moving into a new building." Even with these difficulties, at the end of his career at Huntsville, he concluded that "I've never worked in a better place," and the reason he gave was the people: "Good people pulling together to produce quality products for customers is an unbeatable formula for success." Ultimately, the changes the Center endured were positive because they helped make employees more focused and efficient.[19]

III.

The Path to Competitiveness

Visiting Huntsville Center in June of 1997, Sherri Goodman, the Deputy Under Secretary of Defense for Environmental Security, was surprised to learn that Huntsville Center operated like a business. Because reductions and reorganization throughout the Department of Defense had adversely affected quality, the competitive nature of business at Huntsville Center seemed something of an anomaly. "Do you mean your customers could go somewhere else," she asked. Yes, she was told. Just like any private architect-engineer firm, Huntsville Center competes for work, and its customers can manage their own contracts or have another agency take care of them. The fact that the Center was fully reimbursable, long a point of pride among Huntsville employees, meant that in order to remain as the agency of choice to those it serves, it had to be more efficient and cost-conscious than other agencies and private companies. Over the years, programs such as the Army Communities of Excellence (ACOE), the Army Ideas for Excellence Program (AIEP), and Value Engineering had helped the Center maintain its competitiveness. With the adoption of Total Quality Management and the Army Performance Improvement Criteria (APIC), Huntsville redoubled its efforts to streamline. It improved measurement, analysis, and planning; developed clearly delineated product lines; and reduced barriers through teaming.[1]

Early attempts at improving efficiency

The Center had been working for many years to improve competitiveness and esprit de corps as a means of fighting both the chances of being affected by downsizing and anxieties about being cut. One of the most visible programs to improve the Center was the Army Communities of Excellence (ACOE), a voluntary, Army-wide program directed by the Army Chief of Staff. Huntsville Center began supporting the program in 1989, with an emphasis on facility improvement, personal relations, and efficiency. After taking extensive employee surveys, an ACOE committee spent many hours implementing changes to improve the appearance and safety of its facilities, increase training, and boost worker morale. The committee added to the decor of the offices with paintings, initiated a "clean-up" day to remove excess paper and trash, improved security by installing security cameras, increased equal opportunity training and programs, and maintained a high visibility in the community through a number of charitable and educational activities, such as science fairs, Red Cross drives, and serving on university advisory boards. From 1991 to 1994, the Center submitted an evaluation of progress to an Army-wide competition, winning second place in its category three out of four years.[2]

One of the areas where ACOE was particularly successful, and in which the Center consistently excelled, was encouraging professionalism and progressive thinking among employees. The Center had an aggressive affirmative action program through its Equal Opportunity Office (EEO). Faced with the difficulties of maintaining a reasonable representation of women and blacks in the white, male-dominated engineer world, EEO set hiring goals and pushed for an increase in training, executive involvement, and community support. The Center had a strong Federal Women's Program, Black Employment Program, and Hispanic Employment Program with numerous events and speakers throughout the year – not just during Women's History Month, Black History Month, and Hispanic Heritage Month. These programs also tried

to award outstanding employees and bring attention to the achievements of black, Hispanic, and women employees. The result of these efforts was mixed. While there were few complaints filed with EEO, and none at all in 1996, hiring trends were not as good. Although the number of black employees rose slightly in 1996, the number of women employees fell sharply, primarily due to the transfer of Human Resources personnel to the Redstone Arsenal. In 1997, the Center started implementing the Student Outreach Program to correct these imbalances by establishing a system from middle school through high school and college to develop interests in engineering and science in students with diverse backgrounds. The program would include teacher support, help with special projects, and a Student Career Experience Program (or Co-op), a precursor of student internships.[3]

The professional attitude at Huntsville was due in part to the high level of employee development. The Center offered a number of training sessions and programs that empowered employees to expand their expertise. Many of these were related to specific jobs or equipment, such as the extensive training offered for the Corps of Engineers Financial Management System or refresher courses on timekeeping procedures. One of the most successful programs was the Leadership Management Intern (LMI) program. Each year, ten to twelve employees enrolled in a specialized course in leadership and management. They would attend staff meetings, receive classroom training, and take field trips to other facilities, such as Mobile District's wind tunnel test facility or the General Motors Saturn plant in Springhill, Tennessee. When LMI ceased, another training program filled the void. The Leadership Development Program, a voluntary, self-paced training program, allowed employees to assess themselves, develop leadership skills, and gain experience in leadership roles. In 1996, 34 employees took part in the program, and in 1997, an additional 29 individuals enrolled in the two-year program.[4]

Huntsville Center initiated many improvements through the Army Ideas for Excellence Program (AIEP), which allowed workers throughout the Center to make suggestions that were

passed on to the AIEP coordinator to improve processes or increase job satisfaction and morale. An evaluator would then study a submitted idea to determine its value and plausibility. At Huntsville Center, suggestion adoption rate ranged between five and ten percent higher than the Army's overall rate in 1993 and 1994. Most suggestions were as simple as posting a number in the supply room for getting emergency supplies, publishing a map of the building for customers, defining acronyms on staff notes, or designing a logo to emphasize teamwork. Some ideas resulted in significant savings, such as Dennis Abell's idea to use preprinted labels for moving, which saved more than $1,700. Using e-mail to distribute many publications saved nearly $7,000 during e-mail's first year of use. Adopted ideas amounted to savings of as much as $31,000 in 1994. In March 1996, AIEP became part of the Center's Total Quality Management (TQM) efforts. Instead of sending suggestions directly to Anna Skonieczny, the AIEP program administrator, employees sent suggestions to the TQM coordinator, who then distributed them to Anna, the TQM Quality Management Board, or to a process action team for further evaluation.[5]

On a project level, the Center improved efficiency through the use of a Value Engineer (VE), a project-independent engineer who investigated projects at an early stage to find savings before a redesign would be too costly. In the 1970's, the Center had a full-time VE, but by 1988, it had become an adjunct position held in addition to other duties. Studies consistently showed that a VE could save as much as $20 for every dollar invested, so on August 23, 1992, Colonel Brown reinstituted a full-time VE reporting to the Commander's staff. The position was strengthened in 1993 by the Center requiring that the VE review all acquisition plans. In 1995, VE studies for the Ordnance and Explosives Program resulted in $33 million potential savings to customers over the life of the program, and created savings of over $540,000 in 1996 alone.[6]

Total Quality Management

While ACOE, AIEP, and VE brought improved quality and cost-savings to portions of the Center and its various programs, two new efforts helped organize and enhance the Center's overall process improvement efforts: Total Quality Management (TQM) and the Army Performance Improvement Criteria (APIC). TQM is a set of business principles that focus on customer satisfaction, constant measurement of business practices, and workforce empowerment. Though many of its precepts had already been included at Huntsville over the years, TQM had its official origins at the Center when Colonel Brown established a TQM Implementation Committee in 1993 to determine the best way of introducing TQM. Army Regulation 5-1 addressed the concept of Total Army Quality, but it gave no specific means of how to reach TQM goals. In fact, TQM literature suggests that because it is basically a philosophy, TQM is not applied in exactly the same way by any given organization. Therefore, TQM committee members spent 1993 attending forums and training sessions, reading existing literature, visiting other installations to examine TQM-based programs, discussing options during the Employees' and Commander's Workshops, and meeting with the executive committee to plan implementation. By December 1993, an "off the chart" TQM organization had evolved with Jim Wilson acting as TQM coordinator, and training had begun for those involved in TQM committees and teams. When an employee suggested an improvement, a Quality Management Board would assign a process action team (PAT) – temporary teams that evaluated and suggested ways of improving specific processes – to investigate, making sure all barriers to finding a solution were removed. Once the PAT found and tested a suitable solution, the Quality Steering Group, the governing body, would permanently approve the change. By May 1994, four teams from the Commander's Workshops had evolved into PATs investigating improvements for travel, engineering, contracting, information management, as well as other areas.[7]

Over the next few years, TQM processes initiated a number of improvements, from establishing a government travel office and simplifying delivery order processes to developing

electronic forms for project management or limiting Architecture-Engineering submittals to 130 pages. A TQM Measurement Committee conducted several employee and customer surveys to get additional ideas. The Center tried to increase awareness of these processes by initiating the Quality Times newsletter and later a "TQM Corner" column in the Center's Huntsville Bulletin paper. In 1997, the Center established a Quality Coordinator Office. It was temporarily led by Jeff Seward, the deputy director of training, and was formally headed up by Diane Hesler. When she transferred to the Civilian Personnel Operating Office on nearby Redstone Arsenal, her duties were assumed by the Audit Officer, Donna Rovere.[8]

Army Performance Improvement Criteria

As a business philosophy, TQM had produced many effective changes to the organization and processes of Huntsville Center, but it was the introduction of the Army Performance Improvement Criteria (APIC) in 1995 that truly revolutionized the way the Center did business. APIC is based on the Malcolm Baldrige business criteria, a nationally recognized set of criteria used since 1987 to evaluate business success and customer satisfaction. Named for former Secretary of Commerce Malcolm Baldrige, the Baldrige criteria were established by Public Law (PL) 100-107 as the basis for a competition designed to increase quality in American companies. Any business in three size categories could submit up to a 50-page application to the Commerce Department that explained how it improved quality. A board then evaluated the applicants and awarded the much-coveted trophy.[9]

Because of the success of the Baldrige criteria among businesses, the government implemented competitions such as APIC using the same set of criteria to improve government operations. The Department of the Army initiated APIC in 1995 and made the new standards the basis for all future ACOE contests. There were some similarities in the APIC and ACOE

programs as they evolved at the Huntsville Center. Both, for example, made use of awards to motivate personnel. They both induced improvements in safety, morale, or quality of life. Many ACOE programs, such as leadership development courses or community activities, continued without interruption. But, as Rodney Darby, an APIC coordinator at Huntsville Center, explained, "These criteria focus on performance as opposed to the old ACOE program which focused on facilities and quality of life." The emphasis of APIC was using defined systematic criteria to evaluate performance and customer satisfaction, create organizational strategies, and continuously improve performance.[10]

Also, APIC was much more encompassing than ACOE, eventually incorporating AIEP, the Value Engineer's work, and all previous efforts based on Total Quality Management principles. Many of the structures that the TQM Implementation Committee had put in place remained in existence, including the boards and teams; however, these structures were now made to serve the purpose of implementing APIC standards and improvements. Every activity of the Center fell under the seven APIC categories: leadership, information and analysis, strategic planning, human resource development and management, business results, and customer focus and satisfaction. As the Center improved in each of these categories, it became more efficient and focused overall. Perhaps the best analogy is to view APIC as a car in which leadership is the driver and human resources is the passenger. The car's engine is the unit's business processes, and it runs on the fuel of information and analysis. Strategic planning is the road map to help the car reach its final destination: customer satisfaction; while business results are the miles the car gets per gallon.[11]

One of the strengths of APIC is that it stresses more accurate measurement and evaluation. As Colonel Cunningham noted, "... the organization that accurately measures cost, quality, timeliness, and customer satisfaction has a significant advantage. The successful governmental organizations of the future will be the ones that demonstrate their effectiveness

with solid objective information." APIC was, he said, "management by fact." For Huntsville, a first step towards improving evaluation was to establish an annual customer survey, which was itself evaluated and improved each year. The first survey in 1995 revealed that the biggest problem among Center customers was high cost. In 1996, although cost was still a major complaint, the Center scored consistently higher in all categories. 1997's overall results were not as consistent, though several areas showed marked improvement. The Center also performed benchmarking of key processes, services, and products against competitors or other organizations. Additionally, the Center initiated several internal feedback systems, the most prominent being the 360 peer review process for performance ratings, in which employees rated internal coworkers, subordinates, and supervisors as part of annual performance appraisals. In 1997, the Quality Coordination Office improved this innovative tool by making rating scales clearer and more objective and by not tying awards to the reviews, which tended to make evaluators more generous. It is also important to remember that APIC was a self evaluation tool that led to personal self development.[12]

[Figure 9: External Customer Survey Results]

Once these evaluations had taken place, the Center could use this information in its strategic planning. Planning took place at all organizational levels. At the top, the executive officers and directorate leaders formed the Quality Steering Group (QSG) – one of the TQM structures adopted under APIC – which reviewed performance measures, set values, and made corporate decisions. Members of QSG also served on various internal boards: business meetings, Project Review Board, Management Coordination Group, Program Resource Advisory Council, Information Management Committee, Training Committee, In-progress Reviews, and the Chemical Demilitarization Executive Review Group. The Quality Management Board,

composed of both senior leaders and mid-level employees, established policies, developed strategies, made decisions based on measurements, and set process improvement priorities. There were also several Process Action Teams (PAT), small and usually temporary teams of employees of all levels who were empowered to evaluate processes and develop improvements at both the directorate and cross-functional level. Another TQM tool incorporated by APIC, PATs continued to perform the important function of spot checks and focused improvement efforts. While some formal PATs continued to operate, many organizations – Information Management, for example – formed informal PATs to focus on problems or processes specific to their work.[13]

Better processes, better business results

The result of this planning was nothing more than the reshaping of how the Center operated. One of the first major changes in business processes was the implementation of teaming as a means of reducing administrative or communicative barriers that prevented or delayed tasks from being accomplished. In many cases, individuals or small groups had to expend a great deal of energy to cross these barriers. Teaming empowered employees to be more effective. However, in an organization like Huntsville Center where traditional hierarchical power structures had been the modus operandi, employees had to be continually encouraged to participate. Because of this, moving to a team structure required more planning than first realized. In the past, the Center had used temporary, informal teams to focus on specific projects or problems. Building on this experience, the Center implemented formal teams on a directorate level in 1995. The first directorate to form teams was the Ordnance and Explosives Directorate, though initially the concept was not well understood and resulted in poor implementation. To help facilitate the transition, the Ordnance team went through an extensive, twenty-point training program – PDS Team Concept – that covered the basics of teaming, including the role of

supervisors, social skills such as handling conflict, and technical skills such as improving processes. Once trained, the team defined team structures, goals, and boundaries. A similar process of defining team functions, structures, responsibilities, and workflow occurred in the Information Management Directorate and Medical programs when they implemented teams later that year. Over the next few years, all of the major offices also formed dedicated teams, including Chemical Demilitarization and Automated Systems. There were also temporary, problem-solving teams formed in the Equal Employment Office and Office of Counsel to deal with specific problems, as well as the Process Action Teams. These teams greatly reduced managerial levels, leading to a more productive organization overall.[14]

Another major initiative that resulted from adopting APIC was the development of product lines. Of course, the Center had been providing services through various programs since its inception, but the idea was to divide the programs into product lines, each with specific visions, goals, missions, and strategies. Employees could then focus on the business processes and customer satisfaction for each line. Beginning in 1996, the Quality Steering Group developed a consensus about what the product lines were. Then each product line developed its vision. The initial product lines included Demilitarization, Ordnance and Explosives, System Engineering, Corps Training, and Installation Support. These were further updated in 1997 to reflect philosophical and organizational changes and to add Ballistic Missile Defense, while Installation Support was divided into the product lines of Medical, Major Commands Support, and Operational Forces Support. Underlying each of these product lines were four key processes or activities that composed the services provided: engineering and technical services, construction management, program/project management, and contracting.[15]

[Figure 10: Product Lines]

APIC spurred a number of other changes in business processes, which, though sometimes relatively minor, added up to significant increases in productivity. For example, in order to improve the travel process, a TQM Process Action Team studying travel over several years suggested creating a centralized government travel office for the Center that would process travel orders and vouchers. The PAT also suggested a waiver allowing employees to request their own travel orders, eliminating a layer of review. Another improvement was a simplified acquisition process, including implementation of a system to provide continuous customer feedback to keep them informed. One suggestion that resulted in an improved workload came from above. The Headquarters of the Corps of Engineers had set a goal of obligating 75 percent of all funds by the third quarter of the year. In 1995, Colonel Cunningham asked for the Center's cooperation, arguing that moving work earlier in the year would reduce costly mistakes and increase flexibility in scheduling. By the following year, the percent of contract awards issued in the fourth quarter had been reduced by almost half.[16]

APIC was an extremely successful program in Huntsville. Even in the first year, 1995, the Headquarters of the Corps of Engineers chose the Center's APIC package as one of four that would be submitted to the Department of the Army for further evaluation. The Center was not selected as finalist, but the goal of the submission was self-improvement for the organization. The APIC assessment had revealed some 24 gaps that existed between the Center's processes and the APIC standards. According to APIC team member Rodney Darby, "The APIC Team looked at the criteria and found that as an organization the Huntsville Center is not doing a lot of this. So, the team tried to determine specifically what we were doing in our existing business practices that fit the program's criteria. This was in many cases a 'force fit' but nevertheless became the basis for the team's submittal." After the APIC team evaluated these gaps, it then was able to develop a plan to improve performance in these areas. The following year, the Center was one of three units chosen to represent the Corps in the Army-wide competition, where it was

recognized as one of eleven runners-up. The Audit Office, which had been heavily involved in the APIC and TQM efforts, won the 1997 Internal Review Award of Excellence, naming it the best small audit office in the Army. Then in August 1997, the Army nominated Huntsville Center for the Presidential Quality Award, a government-wide contest based on the Baldrige criteria, and the highest quality award Huntsville could hope to win.[17]

Despite the recognition and accolades Huntsville Center received for its improvements, the real reward was the success it had in improving quality and competitiveness. By 1997, the results of the APIC program were obvious. The Center had reduced overhead and expenses without reducing quality. An examination of the total labor multiplier, or the amount of indirect cost needed to produce one dollar of labor, reveals that the Huntsville Center's services not only cost less than other military districts but also less than many commercial engineering and design firms. A simple comparison of program costs before and after implementation of APIC reveal how extensive the changes were. However, the real indicator of the program's success was how reduced costs affected the customer. Customer satisfaction was at an all-time high, being much higher than other Corps organizations. And while customer evaluations of quality remained consistently high, their rating of program costs had improved.[18]

[Figure 11: Total Labor Multiplier]

[Figure 12: Overhead Rate and Trend]

Huntsville Center had proven itself to be competitive and capable of making the sacrifices necessary to improve quality. The ACOE contest, the AEIP suggestion program, and the TQM workshops, culminating in the APIC program, brought significant changes in the Center's business processes that dramatically increased the organization's efficiency. The teaming, product lines, and dozens of other improvements that came with APIC had resulted in a

more efficient, streamlined, and focused Huntsville Center, but with the continuous evaluation process that defined TQM and was an integral component of APIC, Huntsville was already looking to the future.

IV.

Leader in Automation

One important way that Huntsville Center streamlined its business processes was through automation. The Center had been in the automation business for several years and had provided leadership for the Corps of Engineers in this area. Recognizing the power of computing early on, it had made several attempts at automating select processes over the years. In the 1980s, it had also become involved in developing a variety of computer products for military users: the Military Construction Programming, Administration, and Execution (PAX) system, the Tri-services Cost Engineering System (TRACES), and the Engineer Management Automation Army Reserve (EMAAR) system. In 1993, the Center's participation in testing of the Corps of Engineers Financial Management System revealed that many of the automated systems throughout the Center needed updating to improve business as a whole. Among the changes implemented were e-mail, Internet connectivity, upgraded PCs, improved on-line services, and increased training and awareness for Huntsville computer users.

The Center's use of computers dates back to the 1970s, when affordable computer systems first became available commercially. The Center had a limited number of systems doing specialized jobs ranging from simple processing for office automation (spreadsheets or word processing) to computer aided drafting and design (CADD). These large mainframe systems consisted of a central processing unit and dumb terminals distributed throughout several offices, with applications running in an MS-DOS/command line environment. Because of the cost of systems required to run the more graphically intense applications like CADD, in 1978 the Center

initially chose to borrow use of CADD systems available on nearby Redstone Arsenal during second shift. Within a few years, the Center recognized that such a powerful resource had become an essential asset, and in 1981 the Center leased a PDP 11/44 mainframe system – later upgraded to a VAX 11/751 with color workstations – from local computer vendor, Intergraph Corporation. When the Center expressed an interest in purchasing permanent CADD systems, Headquarters formed a team composed prominently of several Huntsville employees to evaluate the efficiency of CADD. After determining that CADD saved a great deal of effort, in 1987 the team approved the Center's purchase of a VAX mainframe system and two high quality plotters, as well as a server that could access Intergraph's local support network. By the end of the decade, the Center had upgraded to RISC processor workstations running the UNIX operating system, on which they ran CADD, civil engineering, architectural, and geographic information system software from Intergraph and Bentley Systems, Inc. Likewise, most of the other computing had moved from a "host-centric" mainframe environment to distributed microcomputers or Personal Computers (PCs).[1]

Engineering automation systems

At approximately the same time that the Center began to implement computers internally, it became responsible for the development, fielding, operation, maintenance, and support of several automated systems consisting of both computer hardware and software. Four of these systems were part of the Military Construction Programming, Administration, and Execution (PAX) system, a mainframe computer housed in St. Louis, Missouri:

- DD 1391 Processor
- Economic Analysis System (ECONPACK)
- ENG 3086 Processor

- Army Criteria Tracking System (ACTS)

The mainframe maintained a large database of military construction projects that special processors and eventually PCs could access using secure modem lines. Although the mainframe continued to exist to support data storage, the Center worked throughout the 1990's to move PAX applications to the Microsoft Windows operating system, which was quickly becoming the standard software platform in nearly all industries because of its ease of use. In addition, the Center greatly improved the interfaces, added numerous enhancements, and expanded the number of construction programs PAX supported. Center engineers also provided a wide range of support services, such as providing help desk assistance by phone or network.[2]

The Center first became involved in PAX in 1980 when the Corps tasked Huntsville as the responsible agency for the DD1391 Processor. Initially developed by the Construction Engineering Research Laboratory in Champaign, Illinois, this computer system helps users prepare, submit, review, correct, print, and store data for the DD Form 1391, which the Department of Defense uses to give Congress requirements and justifications for military construction projects. Huntsville fielded the first version in 1980, and a greatly revised version in 1991. By 1992, the system maintained more than 28,000 forms with 500 being completed annually. It was estimated in 1993 that more than 1600 users (800 user identifications with two or three users per identification) from the Corps on Engineers, Army Staff, Office of the Secretary of Defense, the Office of Management and Budget, and major installations and commands worldwide were accessing the system by modem.[3]

Over the years, the Automated Systems Branch of Huntsville's Engineering Directorate had improved the 1391 Processor in many ways. The speed had been increased significantly, and an interface was added to access other PAX applications, such as ACTS and ECONPACK, as well as the PAXMAIL e-mail system. In 1991, with the increased use of PCs, the Corps tasked Huntsville with developing PC modules to support the processor. The Center released PC

modules for information systems cost estimation (PC-ISCE) and printing by the end of 1991. Likewise, because of the growing popularity of the Windows operating system, the Center started developing a Windows version of PC-ISCE, which was released in 1996. In July 1993, Headquarters tasked the Center with developing a metric conversion capability, allowing users to submit the forms in metric or English measurements. This capability was fielded in November 1995. The Center continued to expand the number of construction programs it supported, and by 1997, the DD1391 Processor supported more than 20 construction programs worldwide.[4]

In 1985, the Center became the assigned responsible agent of ECONPACK, another PAX application. ECONPACK is a software system that helps the Department of Defense and the military prepare economic analysis reports in support of military construction projects, with an automatic interface to the 1391 processor. The application was developed by the Corps of Engineers Pacific Ocean Division and the Construction Engineering Research Laboratory. Since the application was fielded in 1984, Huntsville Center has been responsible for operation, fielding, maintenance, documentation, and training. Although an enhanced mainframe version was available as late as 1994, the Center fielded a PC version of ECONPACK in 1991 that allowed users to create and modify data without accessing PAX. By 1993 there were an estimated 1000 PC ECONPACK users. Huntsville also developed a PC version compatible with the Microsoft Windows operating system, which was fielded in March 1997. Interest in ECONPACK continued to grow, as demonstrated by steady demands for training after 1993.[5]

The ENG 3086 Processor was also a PAX application for which Huntsville was the assigned responsible agency. The Corps of Engineers uses the ENG Form 3086 to prepare current working estimates of military construction project costs for budget purposes. The mainframe module, developed and fielded by Huntsville Center in 1988, was located in the 1391 Processor in PAX. In 1992, Huntsville Center fielded a PC version that was compatible with PAX, and was updated in 1993 to access and automatically update the DD1391 Processor. PC

Cost, a module that helps prepare, modify, and print cost estimates, was released in May 1995. This popular application has undergone several upgrades, with versions 2.0 and 3.0 being released in 1996 and 1997, respectively.[6]

In 1989, Huntsville Center became the assigned responsible agency for the PAX-based Army Criteria Tracking System (ACTS). ACTS helped plan facilities by providing detailed space planning factors, algorithms, and guidance on use of category codes. The Center was responsible for operation, maintenance, and enhancement of the system and training of its users, while the Installation Planning Division of the Office of the Assistant Chief of Engineers, who had originally developed the program, maintained the database and continued as program manager. Though it had great potential, ACTS was an unfunded requirement on the Corps of Engineer's budget both in 1992 and 1993. Without proper funds, the ACTS database was soon out of date, and support of the program more or less ended thereafter.[7]

Huntsville Center also supported several computer programs not related to PAX. One of the earliest programs for which the Center became responsible in 1982 was the Micro Computer Aided Cost Estimating System (MCACES), formerly known as the Computer Aided Cost Estimating System or CACES. CACES/MCACES aids in the preparation of cost estimates using standardized formats, detailed summaries for cost analysis, rapid execution and monitoring of changes, and report creation and transmission. Originally developed in the 1970s as a mainframe application used in support of the Middle East Division, CACES has been the responsibility of Huntsville Center since 1982. To help develop a PC version, the Corps purchased a similar commercial product in 1989, which the Center then used to develop MCACES. The Army, Navy, and Air Force had been developing similar products, but to avoid duplicated work, the Department of Defense directed in 1991 that the services pool resources. The result was the Tri-Service Automated Cost Engineering System (TRACES). TRACES included MCACES and a number of other applications for which the Center became responsible.[8]

Although the Center continued to make improvements on MCACES, such as the faster, simpler MCACES Gold released in 1993, the TRACES steering committee decided to develop versions of all TRACES applications for the Windows operating system. Huntsville fielded MCACES for Windows in January 1996, and had nearly completed conversion of the program to support the Microsoft Visual Basic programming language by the end of 1997. The conversion of the rest of TRACES was still ongoing, but expectations were that the Center would soon enter an operation and maintenance phase, in which it would provide increased hotline support and training services.[9]

In 1990, the Office of the Chief of Army Reserves (OCAR) designated Huntsville Center as the assigned responsible agency for the Army Reserve Life Cycle Management System, later called Engineer Management Automation Army Reserve (EMAAR). This software tool helps manage inventories; maintain unit information; and develop scope, documentation, and justification for projects. Huntsville Center was responsible for operation, maintenance, and development of software enhancements; user training; and administration of an electronic mail system to support data transfer and communication. The Center released an MS-DOS-based PC version of the software in 1993, with additional maintenance releases following in 1993-1995. In 1995, OCAR requested that the Center develop a version for the Windows operating system and upgrade several EMAAR modules and related applications to be offered on the same platform. On October 2, 1997, the Center fielded the EMAAR Suite. The Center also continued to maintain the DOS-versions with a centralized database and provide testing, training, and hotline support. In 1997, OCAR also asked that the Center develop subsequent EMAAR software versions to incorporate Congressionally mandated changes and other enhancements.[10]

The Corps of Engineers Financial Management System

In addition to developing software, the Center also was involved in testing one of the most comprehensive automated Corps systems, the Corps of Engineers Financial Management System (CEFMS). Developed by the Corps of Engineers Redesign Project Office starting in 1988, this large program attempted to organize, automate, and simplify financial management, project management, and contracting by storing the information on four regional databases. In 1991, because of the Center's expertise in automated systems and its location only blocks away from the Redesign Project Office, the Corps selected Huntsville as a test site for the new software. The Directorate of Information Management (IM) began preparing for implementation immediately in 1992 with training sessions and the establishment of a CEFMS hotline. After performing a site survey in December of 1993, IM installed the first three modules on 75 PCs throughout the Center and started introducing users to signature cards, magnetic ID cards the system required for users to input data into the program. Once IM implemented the CEFMS software and ran the local area network cables, the Directorate of Resource Management (RM) took the lead in getting users started since CEFMS impacted so many RM functions, including more than 62 documents and forms. RM established a help line and a "help" team to assist with problems. Training proceeded using a practice database, and by the end of 1993, more than 90 percent of the Center employees had been trained. The system was in place by Dec. 15, 1993.[11]

Almost immediately, Huntsville users who were testing the program identified more than 700 problems with CEFMS, including difficulties with the graphic user interface. These problems were either corrected or noted for training other Corps users. One suggested change to the travel module resulted in savings of $4,545. Other changes involved simplifying data queries. In many cases, a Huntsville employee experiencing problems had to wait for days to finish doing a required task while a programmer worked out the bug. However, the resulting changes vastly improved the application. A Treasury Department benchmarking of CEFMS and comparable commercial financial management applications revealed that CEFMS was easier to

use and met more Corps of Engineers requirements than the leading commercial products. Once modified, CEFMS was implemented in the other Corps elements, with the last office implementing it in early 1998. Recognizing the indispensable role the Center played in implementing and improving the system, the Chief of Engineers presented an award for exceptional service to the Corps of Engineers Information Systems Modernization Program and praised the Center for taking on the untried system and making it work.[12]

Better business through increased automation

Because CEFMS touched almost everything that the Center did, one of the results of implementing CEFMS was to reveal how many of the Center's processes were outdated, duplicative, or inconsistently automated. Increasing automation was a powerful means to increase efficiency. As Colonel Brown said just before his retirement, "I saw computerization as inevitable, and I saw it overwhelming the engineering profession. It wasn't something that was optional anymore. It was used in cost estimating, and of course it had been used for CADD for a long time." Beginning in 1993, Brown pushed for the Center to incorporate computer technology wherever possible. "If nothing else, Duncan Brown was responsible to pull himself and everyone else in the twenty-first century," he had promised himself, and it was a promise that he and his successor, Colonel Cunningham, kept well.[13]

One of the first improvements was the completion of the local area network (LAN) in 1993, which was a requirement for the operation of CEFMS. Completing the LAN enabled the Center to install electronic mail (e-mail) software organization-wide, including Novell Network, WordPerfect Office E-Mail, and later GroupWise. E-mail allows users to send and receive information in digital format without having to print a paper copy. This automated many transactions, such as memo distribution and making suggestions for the Army Ideas for

Excellence Program (AIEP), enabling them to take place instantaneously. With more than 95 percent of employees connected by 1994, the improvement to communication cannot be underestimated, and Colonel Brown considered it one of his most lasting accomplishments. A related enhancement to communication was the installation of fax machines at many vital offices that were formerly without one, including the Public Affairs Office, the Office of Counsel, and others. This further speeded the delivery of vital documents. Another technology that improved communication was video teleconferencing, which was implemented in the Training Directorate to allow groups at up to six locations almost any distance apart to receive training in a "face-to-face" environment. In 1997, the Center had a total of 26 desktop video conferencing units in use.[14]

By 1996, the Center had connected to the Internet. The Internet is a worldwide network of computers and servers using standardized connections. Although best known today for its commercial applications, the Internet was created in 1969 as a network of military users seeking to ensure continued communication and computer use in the face of nuclear disaster. Within a short time after its inception, other government and educational organizations became involved in networking to gather and distribute information. By 1997, the number of people connected to the Internet had grown to 35 million individuals, companies, private organizations, government agencies, and educational facilities in more than 150 countries worldwide. The Internet operates primarily through a technology called the World Wide Web (WWW or "the Web"), which allows users to move from one Internet site to another by interacting with graphics and highlighted text. The Web uses a standardized language – Hyper-Text Markup Language (HTML) – that can be viewed by special software called browsers. Among the more popular browsers are Netscape Navigator, NCSA Mosaic, and Microsoft Internet Explorer, which the Center adopted as its standard.[15]

[Figure 13: Huntsville Center's Internet Home Page]

Through the Internet, Huntsville employees could access an enormous amount of information about nearly any work- or non-work- related topic. The Center could put its own information on the Internet for other organizations to view, and it could put information for Huntsville employees on its intranet, a secure LAN that allows users to view data using Web browsers. But these were only preliminary applications. In January 1996, the Center placed a $100 million dollar solicitation for an important ordnance removal contract on its Internet home page. This was the first time a contract of this magnitude was announced electronically, allowing interested parties to download the relevant information – more than 300 pages – instantaneously. As ordnance manager Bob Johnson explained, "It is a better way and a more economic way for the government to solicit interest in its contract work. It reaches the contractors faster and it reaches a broader audience." IM planned to hone this process to make future solicitations faster and easier.[16]

Another way automated systems were improved after 1993 was to expand the available on-line services Huntsville employees could access at the Technical Information Center (TIC). In addition to providing an enormous collection of books and publications, the TIC also offered many on-line services, accessed by a computer using a modem. For instance, it provided access to DIALOG, a combination of nearly 400 databases and 329 million records that includes the Commercial Business Daily, Encyclopedia of Associations, and indexes of journals in several professional fields. The Defense Technical Information Center (DTIC) gives access to government-sponsored research not available in public databases. The Online Computer Library Center allows users to search the holdings of all networking libraries to exchange and borrow materials. They also added on-line access to the Redstone Scientific Information Center's holdings. These services, along with the Internet, made it possible for Huntsville personnel to

search newspapers, journals, libraries, and in fact any major source of information without ever having to leave the building.[17]

The Center's Information Management (IM) Directorate also helped implement many automated information systems used by the Army and Corps of Engineers at the Center. The Standard Army Automated Contracting System (SAACONS) had been on-line at Huntsville Center since 1989. This application greatly simplified and automated contracting and procurement processes. IM helped deploy an updated version in 1995 that corrected many problems in the original system and introduced several time-saving features, such as a "go to" feature to find clauses in a contract. In 1997, IM began to prepare to implement a new contracting application, the Standard Procurement System, as well as a supporting Oracle database management system. IM installed two other new applications in 1997. The Information Technology Investment Portfolio System, an application that helps define, develop, track, and report local information technology initiates, replaced the Requirement Statement Management System. Eventually, this system would contain an interface to CEFMS. In support of the new personnel organizations, IM also helped the Civilian Personnel Operations and Activities Centers (CPOC/CPACs) install Personnel Process Improvement applications throughout Huntsville Center to increase communication between Center employees and the CPOC about human resources issues.[18]

Finally, Huntsville invested time and resources in upgrading and standardizing computer hardware and software throughout the Center. The Center moved to a Windows software environment from 1993 to 1994. With the availability of high speed Intel processors, PCs finally had the power to run complex CADD applications, and in 1994 the Center moved CADD operations to Intel-based machines, though it continued to maintain a RISC-based system for older, legacy applications. As the more powerful machines were distributed throughout the different directorates, almost any employee could check out CADD and Geographic Information

Systems applications from the library to use on their desktop systems. In 1996, Congress repealed the Brooks Automatic Data Processing Equipment Act, which required GSA to approve computer purchases. This dramatically improved the speed with which the Center could upgrade its computer systems. By the following year, IM had upgraded and standardized all computer systems, eliminating speed variances and incompatibility that reduced the effectiveness of networking. To help increase compatibility between office automation products used at the Center and outside organizations and companies, IM adopted the widely used Microsoft Office as its standard office software, moving further to a Windows-based environment.[19]

Computer training

Of course, with increased access to computers, it became necessary to increase computer training and awareness. CEFMS required every manager, even those who had never used a computer, to have a terminal on their desk and be able to use them. Those familiar with computers throughout the Center contributed to helping educate non-computer users. In August 1993, the Leadership Management Internship (LMI) class conducted a PC survey to gauge the average employees' knowledge of computers, so they would be able to conduct training and distribute advice from other employees. This information was later distributed through the Huntsville Bulletin and other forums. IM employees – the Center's computer gurus – took a leading role in supporting new computer users. They created a help desk, which fielded more than 250 calls in 1993. In 1995, the Huntsville Bulletin began featuring a regular column dedicated to discussing technology issues. Once on the Internet, IM created a Web site to provide assistance and advice to computer users.[20]

At first, many education efforts were related to CEFMS – how to use signature cards, for example. Later, more general use questions arose. IM columns in 1995 and 1997 concentrated

on improving e-mail usage, explaining the Internet, and widening experience with WordPerfect, the Center's standard word processing software. Perhaps one of the most important issues was how to recognize and avoid computer viruses. A computer virus is a small, self-replicating program that attaches itself to other programs to cause a specific action, from destroying files or taking control of a computer to less harmful – but still malevolent – harassment such as causing crude messages to be displayed. Originally developed in the 1960s and 1970s for research purposes, virus programs multiplied and were eventually altered by pranks and vandals to cause serious problems, the least of which is distraction from assigned duties. There are thousands of viruses in existence that can circulate among computers. Some of the more infamous varieties include boot viruses, which spread to a computer during powering (booting up) to take control of a computer's memory; stealth viruses, which attack a computer in unnoticed ways such as reserving memory (which then cannot be used for legitimate programs) or modifying files or disk sectors; and time release viruses, which are initiated at a specific time. In 1995, after a quick check revealed ten cases of viruses in a single day, IM expended a great deal of effort teaching employees to back up files frequently, to avoid using unknown disks or downloading files from the Internet, and to check for viruses after transferring files using special detection software.[21]

In five years, Huntsville Center had come a long way. Although Center automation experts had pioneered development of several automated systems and led the Corps in introducing computers for engineering tasks, they found they still had room to improve computer applications and processes. By installing e-mail and Internet connectivity, upgrading and standardizing computers, and moving the whole range of applications they supported to a standard Windows environment, they were able to improve communication and productivity internally, and help spread of use of automated systems throughout the Corps and the government as a whole.

V.

Building a Safer Tomorrow:

Demilitarization Programs

Huntsville Center supported several programs related to the demilitarization and destruction of weapon stockpiles, most notably the disposal of chemical munitions at a variety of locations worldwide. As the world moved to a post-Cold War era, the Army sought to destroy many dangerous weapons that were excess, obsolete, or, in the case of chemical weapons, whose use was outlawed by the U.S. government. The Center had been involved in demilitarization programs for several years, including the Chemical Stockpile Disposal Program (CSDP), alternative demilitarization technologies, Russian chemical demilitarization, and the destruction of large rocket motors. But its largest responsibility was support of chemical stockpile disposal. Since 1990 CSDP had grown steadily, and by 1997, half of the Center's funding was dedicated to chemical demilitarization, with a significant increase in responsibility over construction.[1]

The Chemical Stockpile Disposal Program (CSDP)

The Army first began developing its chemical demilitarization program in the 1960s and 1970s, when the Department of the Army directed that obsolete and surplus chemical weapons be destroyed in a safe manner. In 1971, Congress passed the Foreign Military Sales Act Amendment (PL 91-672), which required destruction of American chemical weapons from the Far East Depot at a location outside of the continental U.S. Since the Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532) prohibited dumping chemical weapons in the

ocean, the Army had to explore disposal methods at the Far East Depot, located at Johnston Atoll in the Pacific. With the destruction of M34 cluster bombs at the Rocky Mountain Arsenal in Colorado in the early 1970s, the Army gained enough experience to develop a pilot facility in 1982 using incineration methods at Utah's Tooele Army Depot, the location of the largest stockpile of chemical weapons in the continental U.S. This facility, the Chemical Agent Munitions Disposal System (CAMDS), proved successful, but its capacity was limited.[2]

In 1981, the U.S. Army Toxic and Hazardous Materials Agency signed a memorandum of understanding with the Huntsville Center to support the Chemical Stockpile Disposal Program, whose purpose was to destroy U.S. chemical weapon stockpiles at Johnston Island and eight Army bases in the Continental U.S.: Tooele Depot, Utah; Anniston Army Depot, Alabama; Umatilla Army Depot, Oregon; Pine Bluff Arsenal, Arkansas; Pueblo Army Depot, Colorado; Blue Grass Army Depot, Kentucky; Aberdeen Proving Ground, Maryland; and Newport Chemical Depot, Indiana. Rather than relocating munitions to a central or regional disposal facility and risking accidents during transportation, the Army plan that evolved in the following years entailed building disposal plants at each location, managing the destruction of munitions, and dismantling and removing the facilities after the stockpile at each site had been eliminated. The Center would support design and construction of the nine new full-scale plants, as well as pilot and supportive facilities.[3]

The preferred method of disposal was incineration, which had been approved by the Army since 1982. In the incineration process that had been refined at CAMDS and other locations, weapons were carefully moved from sealed storage bunkers and loaded onto conveyor belts inside the plant where they were robotically disassembled in a carefully monitored, airtight environment. Once broken down into separate elements such as chemical agents, propellants, metal parts, and dunnage, each individual component was destroyed under optimal conditions in high-temperature kilns. After incineration, all that remained was scrap metal, salts, and ash,

which were then sealed in drums for disposal at a landfill. Although this method had been proven safe, in 1988 Congress requested evaluation of alternative disposal methods, such as open-pit burning, evaporation, burial, chemical neutralization, and other incineration methods.[4]

One alternate method Huntsville Center had a hand in developing was a Cryofracture/ Incineration Demonstration Plant (CIDP). In a CIDP, munitions are frozen in a cryogenic bath and crushed into small pieces that are incinerated together in high temperature kilns. This system allowed quick disposal of mixed munition types rather than requiring equipment sized to each munition as with reverse disassembly incineration plants. Under the direction of the Center, contractors Jacobs Engineering Group and GA Technologies developed a facility and process design for a CIDP test facility at Tooele Army Depot in 1987, and in June 1990, Burns and Roe Industrial Services Company (BRISC) was contracted to prepare the facility and process designs. Huntsville submitted these designs for review in March 1992. On May 20, 1992, Susan Livingstone, the Assistant Secretary of the Army for Installations, Logistics, and Environment, terminated design of a CIDP for the Tooele site, but she directed that contractors proceed with designs for both incineration and cryofracture plants for the Pueblo Army Depot site. She would then decide which process to use. In early 1994, she recommended that Congress proceed with an incineration plant at Pueblo Army Depot primarily because of the cost and the immaturity of the cryofracture technology. However, since cryofracture held some promise of being used in non-stockpile chemical weapon disposal, she directed that all designs on the CIDP be completed. By October 1995, Huntsville and BRISC had completed the designs and stored them on CD-ROM for future use.[5]

Public concerns about using incineration as a disposal method continued to grow, so in 1992 Congress requested a study by the National Research Council (NRC) on technologies other than incineration. Presenting its findings in February 1994, NRC reported that incineration “has been demonstrated as a safe and effective disposal process for the stockpile” and suggested its

use "unless and until alternatives are developed and proven" safe and practical. The report also recommended that the Army continue research into alternative technologies, especially neutralization, which NRC deemed ideal for sites such as Aberdeen Proving Ground and Newport Chemical Depot, which store only bulk chemicals in ton containers. In 1996, the Army itself recommended that neutralization followed by secondary processing be used for the Aberdeen and Newport sites. With the passage of the 1997 Department of Defense Appropriations Act (PL 104-208), Congress directed the Department of Defense to continue research into alternative disposal methods, and required that at least two technologies be identified and demonstrated for destroying the chemical weapons at the Blue Grass and Pueblo sites. Research proceeded in coordination with NRC under the direction of the Army's Program Manager for the Assembled Chemical Weapons Assessment at Aberdeen Proving Ground, Maryland. By 1997, the Program Manager's organization had identified seven alternative technologies that it would assess and demonstrate for a final report to Congress in April 1999.[6]

From the beginning, Huntsville Center's primary responsibility in the Chemical Stockpile Disposal Program (CSDP) was facility design. In 1990, the Corps of Engineers designated the Center as Life Cycle Project Manager (LCPM) for the program. Beginning in 1992, as construction plans began to proceed, the Center also became responsible for construction oversight. Because of the number of sites CSDP would eventually entail, construction oversight was a major undertaking. By 1994, construction responsibilities were approximately 40 percent of the Center's chemical demilitarization budget, requiring significant manpower both for contracting and the maintenance of resident offices at seven construction sites. As a result, in 1995, Construction was reorganized as a separate Directorate from the Chemical Demilitarization Directorate. One estimate predicted an increase in the workforce of up to 281 people; although, the strength of the Chemical Demilitarization Construction Directorate had only reached 50 by the end of fiscal year 1997, in part because of delays in

construction at various sites. The influx of these personnel required exerted efforts and preparations by the Construction Directorate and support organizations to hire and care for these new employees.[7]

CSDP accomplishments

Huntsville Center made significant progress with CSDP. The Center had continued to provide procurement support as needed for the CAMDS pilot facility at Tooele, Utah, which had actively engaged in testing equipment for the Johnston Atoll facility and the cryofracture program. The Center had provided design, testing, and training support for a small plant at Pine Bluff Arsenal, Arkansas, to destroy the obsolete incapacitating chemical agent, BZ. This plant began operation in May 1988, and by January 1990, all munitions, the BZ, and the entire drummed inventory had been destroyed, and the plant decommissioned. The Center had also been involved in the Central Demilitarization Training Facility at Aberdeen Proving Ground, Maryland, which would provide training for CSDP. By 1990, construction had been completed under the Center's administration. In addition, Huntsville provided project management and engineering support for simulated equipment test hardware (SETH) at each plant. These simulations used plastic munition models for testing, systemization, preoperational inspection, training, and public demonstrations before a plant went "hot," as well as during pauses in operations such as munitions change-overs. This allowed personnel to train on the actual equipment in a safe environment before beginning to destroy chemical weapons. SETH will be used at all nine CSDP locations.[8]

The Johnston Atoll Chemical Agent Disposal System (JACADS) facility, for which the Center had provided design, contracting, and testing support, had been complete since December 1987, though it did not go "hot" until April 1990 when it began destroying weapon stockpiles.

Initially, the plant proceeded slowly while the Environmental Protection Agency and the Department of Health and Human Services monitored operations to make sure they met with all federal regulatory standards. This operational verification testing (OVT) was complete on March 6, 1993, and the plant was fully OVT-certified by the Secretary of the Army in August 1993. Regular operations began in July 1994, and after a six-month environmentally safe period, the plant became fully operational. Once testing was complete, Huntsville's role was primarily one of coordinating with a contractor for procurement. However, Center engineers never quit thinking of themselves as part of the JACADS team. On August 25, 1994, when Hurricane John passed just north of Johnston Island, the Chemical Demilitarization team established a "situation room" where they could track the weather and organize a response had the facility been severely damaged by the storm. Support of this kind, though often invisible to those working on Johnston Island, helped the JACADS facility reliably fulfill its mission. By 1997, it had destroyed more than two million pounds of chemical agents – approximately one-fourth of the stockpile on the island.[9]

[Figure 14: JACADS Facility]

Built near the CAMDS pilot facility in Tooele Army Depot, Utah, the Tooele Chemical Disposal Facility (TOCDF) had also started incinerating weapons by 1997. Initiated in 1989, construction of this facility by the Corps of Engineers' Sacramento District was finally finished on July 31, 1993. As Tooele Resident Engineer Bob Smith said, "The work was fast-paced and intensive," and along the way, the Corps had encountered considerable difficulties. There were problems with the single cost-reimbursable contract that led to enormous cost overruns. More significantly, testing at JACADS revealed many deficiencies that required changes in the TOCDF design. Even after construction was complete, TOCDF plant modifications kept

Huntsville acquisition, design, and construction teams busy. For example, testing at JACADS revealed that operations would improve with a spare demister, a vessel that removes solid and liquid particles from the exhaust gas stream. Construction teams proceeded in November 1994 to install the new equipment at TOCDF. Altogether, more than 30 construction modifications were initiated after September 1994 under Huntsville Center oversight. There were also difficulties in getting the necessary permits from the state of Utah. Although permitting never affected construction, questions from state agencies required providing additional documentation. Despite these problems, installation and calibration of equipment systems were complete by July 1995, and after a year of equipment testing and personnel training, the plant went "hot" and began destroying chemical weapons on August 22, 1996, to much publicity.[10]

Construction of the plant at Anniston Army Depot, Alabama, also encountered a series of delays due to environmental permitting. The Department of the Army had reaffirmed its decision to proceed with construction in 1991, and the depot began preliminary site work in July of that year. In March 1994, a newly opened resident engineer office received four experienced employees, and Ms. Karen Durham-Aquilera was selected as the resident engineer – one of the first female resident engineers in the Corps selected for such a major project. Delays in obtaining Resource Conservation Recovery Act (RCRA) permits prevented the contract award until 1996. In the meantime, Huntsville proceeded with procuring some $100 million worth of equipment, which was stored in a warehouse near Anniston. Finally, in February 1996, the Army awarded the contract to Westinghouse Electric Company with a limited notice to proceed, a stipulation preventing any activity covered by the pending RCRA permits. Alabama finally issued the permits on June 19, 1997, and construction commenced the following day. With some 500 personnel working at the site, the resident engineer expected construction to take at least 32 months and cost an estimated $211 million. At the end of 1997, construction was 13 percent complete.[11]

[Figure 15: Construction of the Anniston, Ala., Chemical Demilitarization Facility]

Construction at the Umatilla Chemical Depot in Oregon also started in 1997. The Center issued the request for proposal in July 1994. Because Oregon did not issue the RCRA permit until early 1997, the Army waited until February 10, 1997 to award the contract to Raytheon Demilitarization Company, a subsidiary of Raytheon Engineers and Constructors. As with the Anniston facilities, during the interim, the Center had acquired and stored the necessary long lead-time equipment. As the primary contractor for the facility on Johnston Atoll, Raytheon brought many years of experience to the venture. Construction started in earnest on June 10, 1997, and was 10 percent complete by the end of the year.[12]

[Figure 16: Construction of the Umatilla, Ore., Chemical Demilitarization Facility]

The Center also made significant progress with the other chemical demilitarization sites. After completing design of a full-scale facility for Pine Bluff Arsenal, Arkansas, Huntsville sent out the request for proposal in July 1994 and awarded another contract to Raytheon on July 25, 1997. Again, construction was delayed until the state of Arkansas approves the RCRA permit. The design for the site at Pueblo, Colorado, had been put on hold until Assistant Secretary of the Army Livingstone decided whether to use an incineration or cryofracture process. In 1994, she recommended incineration, and design proceeded in March 1994 but was delayed again in 1996 by Congressional requirements for research into alternative technologies. A 1992 Congressional directive had prohibited further design activities for the "low volume sites," Blue Grass, Newport, and Aberdeen, until December 1996 when the Army recommended neutralization for the Aberdeen and Newport sites. On November 17, 1997, Huntsville Center issued a request for

proposal to secure a contract to complete designs for the Aberdeen site based on the neutralization concept.[13]

Overall, CSDP had proceeded slowly but steadily towards its end of destroying U.S. chemical weapon stockpiles. Two sites were operational and incinerating weapons, and construction had begun on two other sites. There had been extensive delays due to state and federal environmental regulations, most of which were unavoidable. Due to international treaty requirements, the Army was under considerable time constraints to complete disposal, and leaking munitions only reinforced the urgency. The military was also sensitive to the importance of disposal facilities meeting legal requirements for health and environmental safety. One way of mitigating these factors was to proceed with designs for the most hazardous sites, while considering the most effective and safe alternative solutions for the remaining sites.[14]

Public reaction to chemical demilitarization

The largest problem the Army faced, however, was overcoming political obstacles resulting from public concerns about chemical demilitarization. Although there was wide support from local government and the public to dispose of chemical weapons, the danger disposal posed to a facility's surrounding region often sparked opposition by a vocal minority to building the plants. Most residents who had grown up around the stockpiles resigned themselves with indifference to disposal or accepted that, in the face of leaking munitions, immediate disposal was the safest choice. Concerned citizens supported by local chapters of the Sierra Club or Greenpeace, protested the Army's disposal plan. For most of these, the real issue was not whether disposal should take place, but whether incineration or neutralization was the safer choice. With each account of shutdowns, equipment modification, or safety violations at

JACADS or Tooele that found its way into local Utah, Alabama, and Oregon papers, concerned citizens and their political representatives expressed their concerns about the process.[15]

Many residents took advantage of public forums like newspaper editorials to argue about the facts. Individuals opposed to incineration pointed to the many safety hazards such as cancer-causing dioxins, even though the trace amounts produced by incinerators fell well below EPA levels. "I think God's emissions standards for dioxin would be higher than EPA," said Donna Burton of Golden Springs, Alabama. Those defending incineration generally noted that "it is the only fully developed process" that could be used in the next ten years, while neutralization was limited to chemical agents not stored in munitions. "There's no alternative, really," Rush Valley, Utah, resident Rose Thorsted said.[16]

Although incineration had been approved by a wide range of scientists, legal experts, federal regulatory agencies, state and local officials, and national leaders, some simply refused to accept evidence presented. "The trouble is we just don't believe them or their scientists," said one Anniston resident. For these hard-core doubters, no amount of debate sufficed, and their protest often turned to other means. On rare occasions, a few people took to the streets of Anniston and Tooele with signs in hand. Before the Tooele plant became operational, a suit was filed by the Chemical Weapons Working Group, the Sierra Club, and the Vietnam Veterans of America Foundation to prevent incineration from proceeding, though in the end a Utah judge ruled that no "reliable evidence" exists that dioxin levels posed any "actual risk to actual persons."[17]

In the face of this controversy, it was vital to keep the public informed. The Center's Public Affairs Office (PAO) played a leading role in making sure citizens knew about construction activities and understood the methods being used. It distributed press information, participated in public meetings to hear concerns, and took part in community events, such as the "Open House" at Tooele and the ground-breaking ceremony at Umatilla, to allow the public to

gain an understanding of plant operations and schedule. Under a 1995 memorandum of agreement, PAO would support Anniston Army Depot during chemical stockpile emergency exercises or any incidents requiring a public affairs reaction. The public response to these actions varied widely. At Anniston, some meetings turned very confrontational, but in Oregon, public support was much wider, and in all cases, local papers were informative and relatively unbiased. Because of the 1994 NRC report and other calls for greater openness and more public involvement, in 1996 the Department of Defense declassified information on the chemical weapon stockpile. This has allowed the Army to become even more open in providing records about the facilities and the stockpiles to the public, and in doing so, "enhance our credibility by confirming that we are not holding back from regulators and the public," said Maj. Gen. Robert Orton, program manager for chemical demilitarization.[18]

The Russian chemical demilitarization program

Closely related to the Center's work on CSDP was its support of Russian chemical demilitarization efforts. After the breakup of the Soviet Union, there were increasing concerns that nuclear and chemical weapons might fall into the hands of extremists or be proliferated to terrorists in the Middle East. In 1990, the U.S. and the Russian Federation signed an agreement to destroy all their chemical weapons. However, as neither country ratified the agreement, only some provisions were implemented. Then in July 1992, the Department of Defense entered into an agreement with Russian President Boris Yeltsin's Committee for Conventional Problems of Biological and Chemical Weapons of the Russian Federation Concerning the Safe and Ecologically Sound Destruction of Chemical Weapons. Under this agreement, the United States, Germany, and Italy would aid Russia in the destruction of stockpiled weapons, with the United States providing support for destruction of nerve agents. Huntsville Center helped man an office

in Moscow and provide advice concerning design, construction, and management of disposal facilties.[19]

Early in 1993, Russian representatives visited U.S. facilities on Johnston Atoll and at Tooele, Utah. A visit to Moscow by Kevin Flamm of the U.S. Army Chemical Munitions Disposal Agency (USACMDA) later in the year opened discussions with the Russians, but at that time, the space for a field office in Moscow was not immediately available. Since a local office was essential to communication, USACMDA sent a team to establish the Chemical Weapon Disposal Support Office in Moscow on June 15, 1993. Once the office was in place, the team was able to initiate discussions of plans for 1994 and push forward a number of efforts, including developing a Russian public affairs program, creating an English-Russian glossary, and implementing an internship program in which Russians would be familiarized with disposal operations at U.S. plants. After 1993, the Russian chemical demilitarization program focused on three areas: establishing a Central Analytical Laboratory (CAL), developing a Comprehensive Implementation Plan, and planning for the construction of a pilot disposal facility.[20]

[Figure 17: Central Analytical Laboratory in Moscow]

The Defense Nuclear Agency (DNA) coordinated the CAL effort with support from Corps of Engineers elements other than Huntsville. By March 1995, the Russians had selected a site for the lab at an existing facility, the Institute of Organic Chemistry and Technology in Moscow. This site would require some additional design and construction, and the Corps of Engineers Transatlantic Division awarded a design/construction contract on October 18, 1996. The second area of focus for the Russian program was the Comprehensive Implementation Plan, and on May 18, 1994, DNA awarded a contract to Bechtel National, Inc. to perform preliminary assessments and prepare a final plan of how to address destruction of the Russian chemical

weapon stockpile. Due to a lack of participation by the Russians, development of this plan proceeded slowly, and the scope was revised to focus on a single site: the Shchuche'ye Chemical Weapons Storage Facility in the Kurgan Region of South-central Russia, where 13 percent of the Russian stockpile was located. The third area, building a pilot plant, finally got off the ground in 1995 when the Support Office issued a Justification of Intent, the Russian equivalent of an environmental permit and engineering evaluation/cost analysis, to build a pilot facility at Shchuch'ye using a neutralization process. After performing the cost estimates and developing an acquisition strategy and schedule, Huntsville Center awarded a contract to Ralph M. Parsons Company in December 3, 1996, to provide Engineering Management Support (EMS) for the facility, which would be designed and built by Russian firms.[21]

The EMS contract has since grown to 18 tasks with a value of more than $45.8 million. Among the tasks performed by the contractor are project management, office support and translation, process scale-up, destruction process equipment design and prototype fabrication, documentation, public outreach, site survey, engineering studies, and planning for final design and construction. Although the Program Manager for Chemical Demilitarization in Aberdeen Proving Ground, Maryland, was the contract manager, Huntsville Center provided support through a deputy who coordinated from Huntsville with Parsons and the Program Manger.[22]

There remained serious challenges with the program. One problem was that the U.S. team had difficulties duplicating Russian neutralization of VX. Beginning in late 1997, a joint lab team began the process of verifying this capability. Additionally, in many cases, Russia lacked adequate funds and facilities to support the program, and this caused some delays. Although the U.S. was funding the facility and some of the utility work, the Russians were to provide infrastructure and utilities, including gas and electric lines connecting to major distribution points. Then there were the more mundane language difficulties and cultural differences that posed daily problems in working with a foreign government. Nevertheless, U.S.

representatives, Huntsville employees among them, were working through these challenges and had made amazing progress.[23]

Solid rocket motor disposal program

Another demilitarization program Huntsville Center supported was the destruction of large rocket motors for the Army Missile Command (MICOM). Over the years, large stockpiles of old, obsolete, or treaty-limited solid rockets had accumulated, and the Army had been disposing of them by open burn/open detonation methods or by washing out the propellants with water and reclaiming the case. Because of concerns that these materials might contaminate the environment, MICOM began developing a laboratory-scale method using ammonia and other chemicals to dissolve propellants until only inert material remained. This process, which is called near critical fluid extraction, minimizes air and water pollution while allowing the recovery of valuable ingredients such as High Melt Explosive for reuse in military explosives. It is considered a "closed-loop" system because all ingredients are recycled or reused.[24]

Beginning in 1992, Huntsville supported MICOM's research and development efforts by awarding, managing, and overseeing a contract to further investigate, validate, and demonstrate near critical fluid disposal methods on a laboratory scale, and develop design criteria and construction/operation cost estimates for a full-size pilot project. In September 1992, the Center contracted Hercules Aerospace Co. (later acquired by Alliant Techsystems) to work on research and development. Rust International, a supporting subcontractor, helped develop design criteria and design pilot plant processes and facilities. By May 1995, the contractors completed testing chemical properties and chemical removal processes. After building pilot facilities near Magna, Utah, they successfully demonstrated the fluid extraction process on a 200-pound batch. In December 1996, MICOM decided to move the pilot facility to Redstone Arsenal in Huntsville,

Alabama, where it will be integrated into a comprehensive missile disassembly and recycling demonstration. Huntsville Center assembled documentation to help relocation and continued to provide technical support, contracting, and management at the project's new location.[25]

[Figure 18: Large Rocket Motor Demilitarization Facility]

One aspect of the program involved the U.S. Army Defense Ammunition Center and School's investigation of marketing recycled propellants to commercial explosive manufacturing companies for use in mining or other industries. With the support of the Bureau of Mines, Huntsville Center contracted Thiokol Corporation and United Technologies Corporation in September 1993 to develop, test, and demonstrate different approaches to packaging and using reclaimed propellants in the mining industry. Economic and technical analysis was complete in November 1994 demonstrating technical and economic feasibility. The Thiokol contract was continued for further research focusing on optimizing blasting agent formulations, shipping dry propellant chips, and developing booster charges, which it successfully demonstrated in 1995. In addition, Thiokol evaluated the possibility of using Longhorn Army Ammunition Plant as a disposal and processing facility site. This effort concluded in 1996.[26]

By the end of 1997, the Center had provided extensive support to U.S. and international demilitarization efforts. The Chemical Stockpile Disposal Program (CSDP), the Russian Chemical Demilitarization program, and support for MICOM's large rocket motor disposal program each reveal the depth of Huntsville Center's expertise in environmental and chemical process design, contracting, and managing projects over a long time and a large geographic area. Despite the severe political and economic challenges, the Center had made significant progress. Two operational chemical weapon demilitarization plants had started to reduce the U.S. stockpile, the Russians made strides in developing their own demilitarization programs, and the

Center continued to support research into alternative technologies for destroying chemical weapons and large rocket motors in an environmentally safe manner. With the added responsibility of construction oversight at the other seven chemical disposal plants, Huntsville Center would be bringing its expertise to reducing the risks of chemical demilitarization for many years to come.

VI.

Renewing and Protecting our Natural Resources:

Environmental Programs

Since the 1960s, concern for the environment has been a growing trend. With increasing pressures being placed on public institutions to correct the environmentally destructive practices of the past, national and state government agencies – including the U.S. military – have attempted numerous corrective actions. Huntsville Center had been involved in environmental projects for many years, and had significant experience in pollution abatement, site restoration design, land and materials management, and preparation of regulatory documentation. The majority of these projects fell under the Defense Environmental Restoration Program (DERP), which continued to be one of the Center's major obligations in the 1990s. DERP accounted for an average of $39 million, or roughly 12 to 18 percent, of Huntsville's annual budget from 1993-1997.[1]

The Center first became involved in environmental programs in 1978 when the Corps of Engineers tasked it to support the Army Pollution Abatement Program. This program originated when the Environmental Protection Agency (EPA) notified the Army that it was violating several provisions of the 1977 Clean Air and Water Acts. The EPA provided guidance for remediation when it published regulations concerning the Resources Conservation and Recovery Act (RCRA), which included the requirement that organizations removing or managing wastes provide a detailed plan in order to obtain a permit. In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) established further guidelines for identifying and removing hazardous wastes. With the passage of Public Law 99-212 in 1983, Congress effectively combined and redefined the military's environmental cleanup efforts in

what later became the Defense Environmental Restoration Program (DERP). DERP required restoration of property belonging to, formerly owned by, or under the control of the Department of Defense and involved the identification, investigation, and removal of wastes and hazardous materials, as well as the demolition of facilities.[2]

The Defense Environmental Restoration Program

DERP had two major subprograms: the Formerly Used Defense Sites (FUDS) program and the Installation Restoration Program (IRP). FUDS was for inactive, abandoned, or transferred Defense properties; IRP concerned active facilities. However, both programs followed the same processes. First were site inventories, which started with a preliminary assessment/site investigation to determine a site's eligibility for restoration. Huntsville Center helped maintain a database of inventories for all sites and perform investigations as needed. After a confirmation study, the Center would rank projects for engineering and construction. The second phase, engineering evaluation and cost analysis, included feasibility studies to determine alternative remedies and the development of a remedial design. The third stage was construction and remediation, whose completion depended on funding and the priority of the project.[3]

The Center's initial responsibility with DERP-FUDS was maintenance of the inventory database. The Department of Defense, state and federal regulatory agencies, and owners of the formerly used sites would identify the site. The Center would then store site assessment data in a database established at the Waterways Experiment Station in February 1993. By 1995, the Center had entered and prioritized more than 8000 sites requiring investigation. The Center or other responsible agencies had conducted more than 7,513 preliminary site assessments by 1994, and another 859 had been started. Despite problems with other Corps of Engineers elements not

updating the site database, by 1996 inventories of all sites entered in the database before August 1993 were complete.[4]

Huntsville's primary role in DERP-FUDS, however, was providing engineering evaluations for the removal of Ordnance and Explosives (OE). Ordnance includes almost any explosives or propellants such as bombs, warheads, missiles, ammunition, landmines, pyrotechnics, and grenades, including nuclear material and chemical agents. The Center's expertise in developing explosive design and blast resistant technology for the ballistic missile programs made it ideally suited for this mission, and in fact Center employees had already gained considerable experience in cleaning military sites for other programs. By 1990, the Center's role in ordnance removal had grown considerably, and it began to emerge as a separate program (see Chapter Seven). In addition to OE, DERP-FUDS also included removal of hazardous and toxic wastes and debris removal, but these were the responsibilities of the Corps of Engineers' Hazardous, Toxic, and Radioactive Waste Center of Expertise and local Corps of Engineers districts.[5]

The other major DERP subprogram was the Installation Restoration Program (IRP), which involved the Department of Defense's active sites. Under IRP, Huntsville Center conducted environmental studies and prepared remedial designs for two major Department of Defense customers: the Defense Logistics Agency (DLA) and the Army Materiel Command (AMC). DLA is a logistics combat support agency whose primary role is to provide supplies and services to America's military forces around the world. AMC is the major Army command that oversees and manages the research, development, and acquisition of systems, equipment, and technology, as well as provides equipment and services to other nations. The Center also supported a limited number of installations through Reimbursable IRP. The environmental activities followed established procedures discussed above.[6]

Defense Logistics Agency projects

The work for DLA involved conducting quality assessments, providing permitting support, and designing environmentally safe storage facilities at DLA marketing offices, depots, and fuel supply points. Huntsville Center also helped DLA in preparing environmental documentation. All remediation and engineering studies must be documented by engineering reports that evaluate and document the potential environmental impact of actions before a decision is made. Among the documentation provided for DLA are environmental assessments for stockpile disposal, the use of DDT, the construction of storage buildings conforming to environmental law for storing hazardous materials, the selection of sites for a new DLA headquarters, and the disposal of special weapons. The Center has supervised contractors to perform approximately 70 environmental compliance assessments at the various DLA installations.[7]

The Center first became involved in DLA projects in 1984, when the Center had begun providing engineering design and hazardous waste storage management services for the Defense Reutilization and Marketing Service (DRMS), a DLA subcommand. DRMS operates Defense Reutilization and Marketing Offices at military installations worldwide. These offices are responsible for disposal of excess Defense property, including hazardous wastes such as oil and paint. Whenever wastes were stored for more than ninety days, storage facilities required RCRA permits. Since Huntsville Center had a reputation as an authority on RCRA, a 1985 memorandum of understanding between the Corps of Engineers and DLA named Huntsville as the designer for the DRMS Conforming Storage Minor Construction Program for facilities within the Continental U.S. The Center produced building designs and specifications conforming to environmental law and helped prepare permit applications, while the Corps of Engineers districts were responsible for contracting and construction. Center engineers produced several designs for

facilities ranging from 1,600 to 80,000 square feet. Although each design was site-specific, the Center was able to standardize designs by using modular design details.[8]

[Figure 19: Environmental Storage Barrels]

After starting with an extravagant design schedule in 1987, funding limitations required that DRMS scale back both the scope and number of conforming storage designs. An audit by the Department of Defense revealed many cost inefficiencies, and DLA had Huntsville redraft designs according to new criteria that would achieve construction savings. As construction on facilities using the new designs began after 1990, the Center served as the single point of contact for managing site-specific facility designs. After the Center prepared designs, Corps of Engineers districts were responsible for awarding contracts and providing any further design adaptations, which the Center reviewed for conformance to technical and legal requirements. Because of the nature of these requirements, the Center maintained tight control over design standards. As of 1997, the Center's standard designs had been used in 108 conforming storage facilities, and many others had not been used for a variety of reasons. It was estimated that an additional 25 facility designs would be provided before the end of the program.[9]

An interesting spin-off to this program was the design of a hazardous waste storage facility at McMurdo Station, Antarctica, which was operated by the National Science Foundation (NSF). The NSF had received some criticism for storing oil and other hazardous wastes at McMurdo Station. When it learned of Huntsville Center's role in designing storage for DLA, NSF contacted the Center in February 1990. In October, NSF and Huntsville Center entered into a memorandum of agreement, in which Huntsville agreed to establish design criteria and prepare designs. A team from Huntsville conducted a site visit in January 1991 to collect data on the materials to be stored, and NSF subsequently approved their general concept. The Center had

completed the concept design by the end of the year, but since NSF made no additional requests, Huntsville returned all unused funds in March 1995.[10]

Huntsville Center also supported hazardous waste investigations and remediation for DLA's depot system. DLA issues food, clothing, medical supplies, petroleum products, and other products to military services in the U.S. and overseas from its depots. Part of this system is the Defense Fuel Supply Center, then at Cameron Station, Virginia, which manages Defense Fuel Supply Points (DFSPs) in the Continental U.S. and Alaska. DFSPs are responsible for the distribution of fuel and other petroleum products. Because of Huntsville's reputation and its experience in supporting DLA's conforming storage program, DLA chose the Center to serve as its single point of contact within the Corps of Engineers for conducting groundwater quality and contamination assessment and hazardous waste remediation as required by EPA and environmental regulation.[11]

From 1993-1997, the Center conducted surface and groundwater assessments and developed remedial designs for several facilities within the DLA depot system. Many of these sites predated World War II, and had been used by DLA or other organizations for the storage of a range of hazardous materials: paints, pesticides, herbicides, organics, diesel fuel, gasoline, jet fuel, solvents, DDT, cyanides, asbestos, acids, lubricants, munitions (including chemical weapons), and chemical ingredients of all kinds. In many cases, there were multiple areas of contamination needing remediation at each site. The Center conducted studies, which included taking soil and groundwater samples for lab analysis, analyzing the direction and flow rate of contaminant plumes, and determining the feasibility and cost of remediation efforts. It then developed remediation designs and provided technical assistance to construction crews contracted by local Corps districts. The Center also continued to monitor sites and verify them for certification of closure. By 1997, the Center had completed designs or provided other services for sites at Defense Depots in Utah, California, Pennsylvania, and Memphis, Tennessee;

the Defense General Supply Center at Richmond, Virginia; the Defense Personnel Support Center in Philadelphia, Pennsylvania; and Defense Fuel Supply Points in California and Michigan. The Center also supported remediation efforts at three privately owned sites which had been exposed to contaminants resulting from waste materials sold to them by DLA: salvage yards in Fairbanks, Alaska, and Akron, Ohio, and a scrap storage area in Gadsden, Alabama.[12]

By 1997, only a handful of sites remained under Huntsville's management, among them the Defense Distribution Depot, Memphis; the Defense Distribution Depot, Oklahoma, near Atchison, Kansas; the Defense Depot, Susquehanna, Pennsylvania; the Defense Supply Center, Richmond, Virginia; and the Defense Distribution, San Joaquin near Stockton, California. The latter, which included installations at Tracy and Sharpe, California, was a long-running and fairly typical restoration project. The Sharpe installation had served since 1941 as a center for storing, shipping, packaging, and maintaining general supplies. Inadvertent leaks of aircraft fuels and other contaminants entered the groundwater by dissolving in percolating water, volitizing into migrating soil gas, and flowing undissolved through soil pores to the water table. In 1987, after Sharpe was placed on the National Priorities List for sites requiring actions under CERCLA, DLA entered into agreements with Huntsville Center and other agencies establishing procedures and schedules for response actions. By 1997, more than 40 sites had been identified, preliminary assessments were 89 percent complete, designs for a groundwater treatment plant and other solutions were 73 percent complete, and cleanup was 34 percent complete. The other installations also had multiple sites contaminated by fuels, ammonia, paint, and other pollutants, and were in various stages of assessment and remediation. It was estimated that all DLA work would be complete by the year 2000 except for ongoing documentation support.[13]

Army Materiel Command projects

Another customer Huntsville Center served under DERP-IRP was AMC. These activities largely paralleled other activities for DERP: conducting site investigations, preparing RCRA permits, hazardous waste management, and developing pollution abatement designs that complied with CERCLA and its amendment, the Superfund Amendment and Reauthorization Act. Huntsville had supported AMC since 1981, when AMC and the Corps signed a memorandum of understanding requesting that Huntsville Center support AMC's environmental studies program by managing contracts and providing technical support. The bulk of these activities were preparing RCRA permits, which included a detailed plan for the management of each waste site. From 1985-1987, the emphasis switched to performing groundwater and soil assessments and remedial actions related to site closures. In 1987, AMC and the Corps of Engineers signed a new memorandum of agreement for Huntsville to support the Installation Restoration Program for active army installations. The Center continued to provide permitting and contracting support. For instance, the Center supported using open burning/open detonation waste disposal methods in 1988; building an explosive waste incinerator and DEAC furnaces in 1989; and designing ordnance, HTW, and low-level radioactive waste remediation and drum storage facilities in 1990. For several sites, the Center managed contracts for surface screening and other tests, and provided designs for soil removal, landfills, treatment centers, and other remediation solutions. By 1992, Huntsville had also awarded several contracts for HTW and ordnance investigations, studies, and remedial actions.[14]

In 1992, the Headquarters of the U.S. Army Corps of Engineers (HQUSACE) initiated a policy of decentralization, which assigned all new AMC projects to Corps districts. Under this policy, Huntsville would execute any on-going projects already underway and transition them to other commands at an appropriate time. However, due to the anticipated reorganization of the Corps, the HTRW design districts would change, and transition plans were put on hold until the issue could be resolved. On October 1, 1993, AMC and HQUSACE signed a memorandum of

agreement that allowed installations to select the executor of their IRP actions. Several installations asked Huntsville for assistance, including Seneca Army Depot, New York; Redstone Arsenal, Alabama; and the Savanna Army Ammunition Plant, Georgia. In addition, the Center continued to support projects at Picatinny Arsenal, New Jersey, and Watervliet Arsenal, New York, which had been initiated prior to 1993. Since HQUSACE maintained its policy of decentralization, Huntsville partnered with Corps of Engineers districts to transition work to them in a way that met both customer requirements and the HQUSACE directive.[15]

At Picatinny Arsenal, field investigations had revealed multiple sites contaminated with chrome or other metal flakes, acid, and degreaser. Initial design contracts were issued in 1989, and in 1994 the Center developed a scope of work and contracted Dow Environmental to perform operation and maintenance of on-site facilities. By September 1995, the Dow contract had been transferred to the control of Baltimore District and Picatinny Arsenal. Contracts at Watervliet Arsenal had been initiated in 1992 to clean sites contaminated mostly by petroleum, oils, and lubricants. By 1994, Huntsville had transferred these contracts to Baltimore District with New York District as project manager.[16]

Redstone Arsenal was a particularly complicated clean-up operation with more than 200 sites on the Arsenal or adjoining property. Investigations conducted from 1992-1993 revealed several sites that required no further action and some that were contaminated by organic compounds, DDT, metals, and chemical agents such as arsenic and Lewisite. One site at an old chemical plant included plumes of DDT affecting nearby Wheeler Wildlife Reservation and local communities. Huntsville Center worked with Mobile District to issue several contracts for remediation, and multiple interim actions were initiated. In late 1995, the South Atlantic Division decided that while Huntsville would complete any initiated work, the Mobile or Savannah Districts would handle all future projects. By 1997, the only remaining work was

reviewing a feasibility study for two of the sites and closing out the contract, which was expected to be complete in 1998.[17]

Senneca had requested Huntsville's assistance in 1993, and site investigations revealed several sites contaminated with oils and solvents, one with ash, and several with nuclear wastes. Although the Center was going to transfer work to New York District, an agreement in 1995 allowed the Center to continue working on the project to oversee initial contracting processes. The Center also continued to support feasibility studies and provided quarterly groundwater sampling. Nevertheless, it was expected that the Center's role in AMC-IRP would also end soon after 2000.[18]

Support for the Office of the Deputy Assistant Secretary of Defense

In addition to the DERP program, Huntsville Center also supported the Office of the Deputy Assistant Secretary of Defense for Environmental Studies (ODASD[ES]), the Center's highest ranking environmental customer. This office had requested a study in 1984 of waste reduction at Department of Defense facilities. Because the Center was so successful in preparing this study and had reacted so quickly, ODASD(ES) continued to request impact analyses, engineering studies, and other reports to support its development of environmental policy. To support ODASD(ES), Huntsville managed contracts to maintain the DERP Management Information System database, prepare the DERP Report to Congress, develop and refine the Defense Priority Model, prepare data to defend Defense budgets, and prepare program management plans. The Center coordinated various delivery orders for these and other technical policy support functions. Most recently, the ODASD(ES) tasked Huntsville to support the environmental task force, model program, planning, and budgeting for the BRAC program.[19]

Huntsville Center's primary responsibilities were awarding, managing, and modifying contracts to deliver the required reports. An earlier contract with Earth Technologies was replaced in 1993 by a delivery order contract with PRC Environmental Management, Inc. From 1993 to 1995 when the contract ran out, more than 40 delivery orders had been issued. In 1996, the Center contracted Booz, Allen & Hamilton to complete the required reports. The Center also provided other services as required by ODASD(ES). In 1994, the office requested that Huntsville provide small purchase contracting support to the National Research Council. The same year, the Center became the central point of contact for the Legacy Resource Conservation Cooperative and Interagency agreements, a job it would maintain until after 1997.[20]

Huntsville Center's involvement in environmental programs had been a mainstay for many years. Since the days of the Army Pollution Abatement Program, the Center had played a major role in ensuring the environment was safe for soldiers and the public. Under DERP, the Center had excelled at identifying sites and developing remediation and waste management solutions for both active and formerly used defense sites. This expertise had brought it involvement in several other environmental jobs, including supporting the development of Department of Defense environmental policy. As site investigations are completed and many environmental tasks are decentralized to other Corps elements, the Center's role in working with active army installations may slow. But, as we shall see, the Center's special responsibilities with ordnance disposal will keep it central to the Army's environmental mission.

VII.

A Public Safety Program:

Ordnance and Explosives Removal

By 1993, the largest and most publicized environmental work Huntsville Center performed was the removal of ordnance and explosives (OE). Although originally only one of Huntsville's duties under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS), over the years OE removal had evolved into a separate program with its own structure, subprograms, and responsibilities. With the growing number of OE sites identified across the country, the OE program continued to be defined and expanded until Huntsville Center's mission included ordnance investigation, design, and removal, as well as specialized services as the Corps of Engineers' Center of Expertise.

As the nation moved towards greater environmental responsibility, Congress enacted what would become the Defense Environmental Restoration Program in 1983 to provide for the management and remediation of wastes on property actively used by or formerly belonging to military installations (see Chapter Six). A large part of this work involved cleaning inactive, abandoned, or sold Department of Defense properties, which came under the auspices of the Formerly Used Defense Sites (FUDS) program. Before 1970, military installations often disposed of ordnance by burying it, so many of these sites contained potential unexploded ordnance (UXO), military munitions that had been fused or armed and that remain unexploded either by malfunction or design. Huntsville Center had gained a reputation as an expert in designing blast resistant technologies while supporting the Ballistic Missile Defense, Munitions Production Base Support Construction, and Range Modernization Programs. Some of these sites

had required ordnance removal, including the Milan Army Ammunition Plant, the Katama Firing Range, and others. Because of this extensive experience in working with explosives, the Corps of Engineers made Huntsville Center responsible for all ordnance removal engineering at formerly used sites.[1]

By 1990, Huntsville Center had gained considerable experience with OE removal at Hawthorne Army Ammunition Plant, Nevada; Martha's Vineyard, Massachusetts; Kodiak Island, Alaska; and Tidewater Community College, Virginia. Since OE was relatively new to most Corps of Engineers components, and in fact there were no definitive Department of Defense guidelines about ordnance removal, the Headquarters of the Corps of Engineers came to heavily rely on the expertise of Huntsville engineers for ordnance actions and policy support. On April 5, 1990, it named Huntsville Center the Mandatory Center of Expertise (MCX) and Design Center for Ordnance and Explosive Waste. As MCX, Huntsville had increased responsibilities, and Corps customers were required by regulation to receive ordnance services from the Center on a mandatory basis. Over the next several months, the Center developed standard processes and structures, and on April 19, 1992 Headquarters officially approved its management plan.[2]

The Center's ordnance efforts fell under the direction of two distinct entities: the Mandatory Center of Expertise (MCX) and the Design Center. The MCX provided technical leadership and management in establishing policies and procedures for ordnance responses and developing and overseeing education for organizations involved in ordnance actions. The Design Center was responsible for coordinating with Corps of Engineers district offices to design and execute ordnance actions according to established procedures. Initially, these agencies operated as a single functional organization within Huntsville Center and pulled experts from a variety of fields to meet the organization's overall responsibility. For example, while the Engineering Directorate provided environmental and civil engineering, the Contracting Directorate and Office of Counsel helped prepare and review removal solicitations and award contracts; the Advanced

Technology Branch of Engineering helped test innovative technologies; the Public Affairs Office contributed to planning, developing, and helping manage public information and community relations; and the Office of Safety helped minimize risk by interpreting regulations, providing guidance, and reviewing system safety. Before 1992, all available OE personnel were dedicated to completing on-going projects, so the Design Center responsibilities received most of the attention. By 1993, however, as the organization gained personnel dedicated to MCX functions, the MCX emerged as a distinct organization.[3]

With the Center's efforts to reorganize along its product lines in 1995, many support personnel in other directorates that had been attached to the MCX on paper actually moved to the same area. The Ordnance and Explosives Team was formed as a separate directorate under the management of David Douthat, and contracting and safety experts were relocated to work more closely with the OE group. Another major organizational change within OE came with the team concept that had been introduced throughout Huntsville Center by Colonel Cunningham as part of Quality Management/Army Performance Improvement Criteria efforts. OE was the first organization to formally adopt a team structure for its 50 employees. All OE functions were incorporated into one organization with a single supervisor reporting to the deputy commander. Within this organization there were five teams focusing on program management, execution, design, MCX, and explosives safety. Eventually, these teams would be expanded into areas such as financial management, response planning, innovative technology, design, archive searches, execution, and recovered chemical warfare material. The teams cooperate on a variety of issues, thus streamlining communication and enhancing decision-making. By emphasizing working as a team, each team member could bring its expertise to the total effort for ordnance remediation.[4]

In July 1996, Headquarters decided to decentralize ordnance design and execution to other Corps districts by 1999. Huntsville Center had notified Headquarters in 1995 that it was being overwhelmed by an expanding workload. As Corps districts gained knowledge of OE and

could do the job, additional OE agencies would speed OE removal and reduce risk. In October 1996, the Center submitted plans to reorganize OE into an enlarged MCX and a greatly reduced Design Center with an emphasis on recovered chemical warfare materials. Concurrently, Headquarters began to evaluate the districts in order to determine which two would act as "eastern" and "western" OE teams. Huntsville would then provide training for these new organizations, which would be followed by a six-month transitional period. Headquarters went as far as selecting Baltimore District and Sacramento District as its new OE centers, but on March 17, Brig. Gen. Phillip Anderson, the Director of Military Programs for the Corps, announced that decentralization of OE was postponed because growth in the program had not materialized, making decentralization less cost effective. Decentralization of the program would be taken up if workload increased in the future.[5]

Policy guidance and training

After 1992, the MCX became central to setting the pace for the evolving ordnance program. Because legal authorities such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the 1996 Superfund Amendments and Reautorization Act (SARA) did not clearly define the treatment of OE, the OEW MCX was left to provide guidance about proper interpretation of these laws. Although not all ordnance sites would fall under the authority of the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS), it had processes similar to those required by CERCLA while also addressing safety. By handling all ordnance sites in the manner prescribed by DERP, the MCX had largely resolved issues such as compliance, permit applications, and standard operating procedures for contracting. However, over time, the ordnance team was confronted with many issues that required redefinition. For example, the MCX had to clarify policy related

to time-critical removal actions, the depth of subsurface clearance, how to search archives thoroughly, and rules guiding the removal of recovered chemical warfare material. In order to coordinate environmental policy properly among the several Corps districts, the MCX distributed national, Department of Defense, Department of the Army, and Corps policies; developed work and safety standards and regulations; published procedure manuals and handbooks; and provided review and advisory support. With the 1996 passage of the EPA's Munitions Rule, which allowed OE to be regulated as a hazardous waste under RCRA, and the Department of Defense's Range Rule, which treated OE separately from both RCRA and CERCLA requirements, a major revision of existing documents became necessary beginning in 1997.[6]

As a way of promoting the Center's expertise and ensuring that organizations taking ordnance actions were familiar with its guidelines and responsibilities, the MCX offered numerous workshops and training courses to Corps districts and other military organizations. In some cases, the training was designed to supplement available documents; at other times, it introduced new procedures and technologies or reviewed projects. The courses covered a wide range of fields: engineering, public affairs, project management, legal issues, and safety. For example, the MCX offered ordnance workshops to discuss site safety, ordnance recognition, site investigation procedures, detection technology, and chemical warfare materials, among other topics. In addition to holding workshops, Huntsville Center also offered traditional, proponent sponsored Corps of Engineers training courses on a semiannual basis. In 1994, the Center submitted a strategic training plan to Headquarters that included six new courses. Many of these training responsibilities were undertaken by the new Professional Development Support Center in 1996.[7]

Public involvement

Another way the MCX supported organizations working at ordnance sites was to provide advice and help with public involvement. Safety was a Corps priority in dealing with ordnance, but the inherent danger of the materials attracted a great deal of attention. Such actions as road closings and restricted site access sometimes created suspicion and negative publicity. At the Black Hills Army Depot, South Dakota, ordnance removal efforts suggested to some that the Army was conducting secret operations, a situation that was only exacerbated by the impression that "they (federal officials) didn't tell anyone what they were doing." For several sites, the release of chemical agents during OE removal was the primary concern. The death of several hundred sheep on ranches near Black Hills raised serious questions, though the deaths were not associated with ordnance. At Camp Sibert, Alabama, close proximity to the chemical demilitarization facility at Anniston caused many residents to pay increased attention to chemical weapon storage and destruction. At other sites, the main issues were the Corps' methodology, the time it took, and the cost. The Army was extremely careful and spent months researching and characterizing a site. It was only natural that some communities wanted the job done both more quickly and completely, especially as the public learned more about potential risks. At Lowry Bombing Range, Colorado, state and local officials characterized statistical sampling used at ordnance sites as "ridiculous" and "an accident waiting to happen," despite the fact that such methods had been used successfully at dozens of sites across the nation. Although in most cases the majority of residents were supportive and the press reaction was objective, sometimes concerns resulted in political inquiries or legal actions.[8]

Since 1993, public involvement activities at ordnance sites had been the responsibility of the local geographic Corps districts. As MCX, Huntsville Center supported public affairs extensively for projects related to OE and on request took the lead in such efforts. Public affairs experts in Huntsville provided historical and other site background information, and in fact, the majority of public inquiries at Huntsville Center were related to ordnance. They also helped

advise on planning public events and offered training on how to deal with the public and press. One of the lessons they passed along to Corps districts was the importance of risk communication techniques, such as formatting public meetings to allow for mingling and reduce an "us versus them" mentality. Beginning in 1993, the Department of Defense required that any installation closing under Base Realignment and Closure (BRAC) had to establish a Restoration Advisory Board (RAB) composed of local community and government agencies. This not only provided a forum for the exchange of information, it gave those with the greatest knowledge of community needs a role in the ordnance project. Exchanges at the RABs and other forums were usually informative and not hostile, even when concerns were expressed. Ironically, though, interest at some sites lagged from both ordinary citizens and special interests. Other important tools for helping keep involved agencies and interested parties informed were the OEW Newsletter, published on a quarterly basis starting in 1994, and the MCX Internet home page, which contained news, policy data, project updates, and business opportunities such as upcoming contracts.[9]

[Figure 20: An Ordnance Site Public Meeting]

Innovative technologies

One of the MCX's most important tasks was helping develop advanced ordnance removal methods under the Innovative Technology Program. The Innovative Technology team attempted to reduce costs and risk by integrating and adapting new or existing technologies into ordnance efforts. Rather than conduct research and development, the MCX monitored other agencies and private industry for technology that could have useful applications to OE activities. The Innovative Technology team, including Huntsville employees, Corps of Engineer lab

technicians, and contracted scientists and engineers, helped identify, evaluate, test, and introduce a range of technologies. These generally fell into three categories: technical information, blast effect mitigation technologies, and field tools.[10]

[Figure 21: A Magnometer]

Ordnance removal requires compiling an incredible amount of information. To help sort through this material, the MCX developed an extensive Geographic Information System (GIS) that combined electronic site maps, a computer database containing site information, and powerful analysis software. Using data from satellite images, aerial photographs, U.S. Geological Surveys, historical and current maps and photos, site surface sweeps, geophysical analyses, and other records or studies, the GIS was able to construct maps and models of a site. For example, magnetic anomalies located during mine sweeps were cross-referenced with an aerial photograph or maps to identify by grid coordinate the exact location of ordnance. Preliminary studies indicated this might have reduced the need for excavation by as much as 50 percent. One of the software tools the MCX used with the GIS, the Ordnance and Explosives Knowledge Base (OE-KB), helped analyze this information. By categorizing data from collection instruments such as magnometers, gradiometers, and electromagnetic induction (EMI) sensors, OE-KB helped distinguish between ordnance and other scrap metal, and even predicted depth and size at accuracy rates as high as 80 percent. The MCX made the site data available to other agencies through the Project Database, which includes FUDS data and OE cost effectiveness risk analyses, and through a CD-ROM-based Internet server.[11]

Other technologies investigated were related to the mitigation of blast effects. In many cases, when it was impossible to render munitions safe enough to remove from a site, exploding the ordnance was necessary. During on-site detonation of UXO, it was essential to contain the

explosion and its after-effects. The MCX evaluated several blast containment devices, including a portable, reusable tank for detonation of small ordnance and a blast cage capable of withstanding heavy blasts from large munitions. Built by a contractor at the Southwest Research Institute (SwRI) in Texas, the smaller container was a steel cylinder attached to a steel-framed skid to prevent being overturned. It used a multilayer fragment capture system, in which sand and water absorbed the heat and velocity of the explosion. Though evaluated in 1996 to withstand pressures of up to six pounds of TNT, later tests revealed it could capture all fragments from even larger munitions, such as 75-mm howitzer rounds and 60- and 81-mm mortars. The larger cage was built specifically for work at Morgan Army Depot, but since the smaller container could withstand large blasts, the cage was not widely used in other projects. Another device that gained some attention was a vapor containment shelter. Because a few munitions contained chemical agents, some OE projects required devices that prevented downwind hazards. The MCX had experimented with a vapor containment shelter at the Spring Valley ordnance site in 1993. Building on this experience, SwRI tested a prototype in May 1994 that contained agents with a 99.47 percent effectiveness, and extracted them using an air-handling system. The MCX experimented with a number of other blast mitigation technologies, including barricades and barriers, as well as software that could calculate hazards and blast zones.[12]

The Innovative Technology team also reviewed many devices that could support investigators and remediation teams in the field. These included a mobile chemical warfare material laboratory, whose purpose was to save time in providing important analyses; detection devices such as magnometers and gradiometers that helped detect underground magnetic anomalies; and global positioning systems that enabled field workers to determine exact grid coordinates from satellite positions and relocate sites within one centimeter's accuracy. The MCX also tested and adapted the use of a remote video inspection tool, which included a 7.5-meter snake scope that allowed viewing of ordnance from a safe distance. In a Black Hills study,

the MCX reviewed an optical sensor experiment that provides contamination information not visible to the naked eye. Another project examined the use of the Navy's Magic Lantern sea mine detection system to detect underwater FUDS sites. And of course, there were software applications that helped site investigators characterize a grid marked for investigation without excavating all anomalies. Many of these devices were adapted immediately for ordnance investigation and removal.[13]

Ordnance response projects

The MCX provided essential support by developing the procedures and technologies to be used in OE projects, but the ordnance response actions themselves were the responsibility of the OE Design Center, which helped design and execute responses and supported Corps of Engineer districts with ordnance projects. These projects fell into three categories: DERP-FUDS sites, BRAC sites, and other actions funded by government agencies. The majority of the Design Center's obligation was with DERP-FUDS, which projections suggested would continue at high levels for years to come. From 1994 to 1996, BRAC obligations increased to just under the DERP-FUDS level, though the number of BRAC projects depended greatly on the pace of closures and whether or not there would be future rounds of closures. Projects for other agencies were conducted infrequently on an as-need basis and did not receive significant funding.[14]

Although there were distinct differences between FUDS, BRAC, and the other projects, they followed similar procedures established by the MCX: preliminary assessments (PA), an archives search, engineering evaluations/cost analysis (EE/CA), and finally removal actions. The first step, the PA, was a study conducted to determine site eligibility – whether contamination existed and whether it was the result of Department of Defense actions. With more than 8,000 FUDS sites requiring assessment, it was important to weed out ineligible claims. The PA

included review of readily available records, a visual survey of the site, and estimation of risk. Once a site was determined to be eligible, the OE team assigned to the site would conduct an extensive archives search of both governmental and non-governmental sources, including the National Archives and Records Administration, the Library of Congress, military history agencies, state archives, university libraries, private collections, and others. A thorough initial search often saved problems in the long run, such as running across sites accidentally. The EE/CA included this search data, as well as site characteristics, objectives, comparisons of removal action alternatives, cost estimates, and the recommended action. During this phase, the OE team would secure funding, prepare the EE/CA, publish it, and respond to public comments. Removal, which included the physical location, safe removal, and protection of the public, was typically conducted by a contractor coordinating with the Design Center, the local Corps of Engineers district, and public officials. In cases of emergency, the 52nd Ordnance Group–Explosive Ordnance Disposal helped remove and handle the UXO.[15]

Formerly Used Defense Sites

The majority of OE projects were for DERP-FUDS, which focused on sites that were once Department of Defense properties. Some of these sites had been sold or transferred in recent years to other government agencies, industries, or private citizens. Many had not been used by the military since World War I and had changed owners several times. Information about the location, amount, and type of ordnance at FUDS sites was often extremely difficult to verify. In many cases, the OE team did not know how extensive a site was until well into a project. Also, because most of the sites were located in the midst of civilian populations, a significant amount of danger was involved, as well as a fair amount of publicity, requiring fast

but safe action. Because of more than a decade of updating the FUDS database, nearly all of these sites had already been identified, inventoried, and prioritized based on the hazard level.[16]

[Figure 22: An Ordnance Site]

A fairly typical FUDS site was Camp Croft, South Carolina. This 20,000-acre site near Spartanburg was established in 1940 as a training facility and gun and mortar range for new recruits. In 1947, following the end of World War II, the Army closed Camp Croft and returned the property to state and local governments. In 1995, the land was being used for residential and commercial development, and a large portion was part of the Croft State Park, which received some 300,000 visitors each year. Preliminary investigations revealed that ordnance was present and that park visitors could be in danger. After conducting archive searches and interviewing former soldiers trained at the camp, the OE team identified two areas requiring time-critical removal actions: private property at the Red Hill parcel and the public camp ground area in the park. Contractors had completed these removal actions in March and June 1995 respectively. Some sixty 60-millimeter mortar rounds were removed from the areas. Continued investigation revealed 20 additional impact areas with 10-20 times more ordnance than previously estimated. The engineering evaluation/cost analysis completed in January 1996 recommended removal actions for the campgrounds, horse ring, horse trains, and residential area, and a removal contract was awarded in May 1996. Unlike the studies, which were conducted only in marked areas, removal would require closing parts of the park because of the dangerous work. A second phase EE/CA was conducted in late 1996 for additional sites.[17]

BRAC sites

Huntsville had been supporting BRAC sites since a 1990 request by the Office of the Deputy Assistant Secretary of Defense for Environmental Affairs. Congress had passed several BRAC acts to reduce the size of the Department of Defense. Before the transfer of property could take place, the Department was legally required to guarantee remedial actions to protect human health and environment from the effects of hazardous substances stored there. As MCX and Design Center, Huntsville Center was responsible for OE removal at all BRAC sites. Because these sites were current military installations, there was significantly more site data available, and far less media concern. The Center had more control over access to sites to limit exposure, and with the date of turnover fairly well established, could plan more smoothly for each phase of the removal process. Unlike FUDS sites, funding for BRAC sites was rarely based on the level of hazard, and priorities between installations was not a consideration for determining when remediation needed to be complete.[18]

[Figure 23: Ordnance Removal]

The Design Center supported BRAC remedial actions at Fort Monroe, Virginia; Savannah Army Depot, Georgia; Pueblo Army Depot, Colorado; and at nearby Fort McClellan, Alabama, among others. One project that received some notoriety was Fort Ord at Seaside, California. Established in 1917 as a maneuver area and range for the 11th Cavalry and 76th Field Artillery, the 28,000-acre installation had been occupied by the 7th Infantry Division from World War II until 1993 when the BRAC board recommended closure. In January 1994, the Center contracted Human Factors Associates (HFA), Inc. to begin sampling sites identified in the archives search report. California State University required immediate clearance of a 340-acre parcel of land it had purchased, and by June 30 HFA had cleared 260 acres to a depth of four feet. The contractor removed 21,000 pounds of scrap metal, 90,000 small arms rounds, and

13,000 other rounds of ordnance. The remainder of the University parcel was cleared by September 1995, when President Clinton dedicated the land. A second contractor, UXB International, then proceeded with clearing 8,000 acres of multi-range training area. In 1996, the Center started preparing the EE/CA in two phases: Phase I evaluated all remedial actions and sampling that had occurred to date; Phase II determined how the remainder of the site would be cleared. By 1997, Huntsville had transferred all contracts to the supervision of the Sacramento District.[19]

Other OE projects

Occasionally, the Design Center helped support clearance of sites which were neither DERP-FUDS nor BRAC sites. One example was a site at Divex Corporation outside of Columbia, South Carolina. Divex researched and manufactured munitions. After an explosion at Divex killed the owner on September 6, 1993, the Environmental Protection Agency (EPA) conducted an investigation and discovered that the 23-acre facility contained more than 100 chemicals, 500 unmarked gas cylinders, and 40,000 pounds of explosives, including mines and artillery fuses. On learning the magnitude of the hazard, the EPA called in other expert agencies, including the MCX and Design Center. Starting in January 1994, the Design Center, a contractor, and the U.S. Army Defense Ammunition Center and School began the identification and on-site disposal of explosives. Working at night, the Design Center was able to complete the ordnance portion of the cleanup in a little over two months. Such instances of projects for programs other than FUDS or BRAC were rare, but the expertise of the MCX and Design Center was essential on these occasions.[20]

To add to the difficulties of removing ordnance, many ordnance sites with which Huntsville became involved contained other hazards, such as hazardous, toxic, and radioactive

wastes (HTRW) or chemical warfare material (CWM). Although HTRW removal was the responsibility of the Missouri River District, when HTRW and UXO appeared together, Huntsville Center coordinated with the Missouri River District to ensure proper handling of ordnance issues. To handle CWM, Congress had created the Non-Stockpile Chemical Materiel Program for the recovery of all chemical munitions or their constituents. The Army directed that the Corps of Engineers work with the Program Manager for Chemical Demilitarization and the Chemical, Biological Defense Command to coordinate disposal of CWM. Huntsville Center formed the CWM team, which located, identified, and removed CWM, as well as provided training and policy for execution. Once CWM was removed, the Chemical, Biological Defense Command's Technical Escort Unit, supported by Huntsville contractors, transported the materials to a designated repository for destruction under the authority of the Program Manager for Chemical Demilitarization.[21]

Huntsville was involved in many CWM sites, including Spring Valley, Washington, D.C.; Jackson, Mississippi; Raritan Arsenal, New Jersey; the Black Hills Army Depot, South Dakota; and a bunker near a World War II airstrip in Santa Rosa, California. A high profile CWM site was Spring Valley, an affluent Washington D.C. neighborhood. On January 5, 1993, workers excavating a sewer line discovered munitions buried six to eight feet below the surface. Records revealed that in 1917, the Bureau of Mines and then the War Department had leased the land from the American University to use as a chemical agent and munitions training area, range, and proving ground. The ordnance response was initiated soon after discovery and occurred in two phases. Phase I was the emergency removal operation. Over the course of two weeks, the response team extracted a fair amount of scrap metal and 141 intact munitions, 43 of which were thought to be live chemical weapons and were sent to other locations for destruction. The MCX and Design Center helped locate ordnance, provided quality control, and supported public affairs. Phase II started January 21 with the approval of Spring Valley as an official FUDS site. After

conducting an archives search, geophysical survey, and soil sampling for the remainder of the 500-acre site, the OE team located 53 anomalies, but only one other live munition was found.[22]

Since Huntsville Center became the Mandatory Center of Expertise and Design Center in 1990, the ordnance program had expanded significantly and repeatedly demonstrated its value in making the ordnance cleanup of practically any type safe to both people and the environment. From 1993-1997, the number of known sites needing ordnance removal had increased, but the OE program at Huntsville had remained relatively constant both in funding and supporting personnel. The MCX helped develop many of the policies and procedures used nationwide and made sure both OE program and individual project data was available to organizations through training, publications, and the Internet. It had adapted and tested the use of advanced technologies from many fields for use in OE projects. Using these technologies, the Design Center had provided design, removal, and supervision support for dozens of projects – many of incredible scale and complexity. All were accomplished without a single death of those removing ordnance and without injury to members of the public. Huntsville's leadership in this vital area had not only cleaned the environment, it had saved lives – in the present and for the future.[23]

VIII.

Acquiring a Brighter Future:

Contracting and Procurement Missions

Over the years, many of Huntsville Center‘s missions contained important procurement elements: gathering equipment for SENTINEL radar facilities, procuring parts for chemical demilitarization plants, providing energy monitoring systems, and so forth. Since 1971, however, the Center has been involved in several missions whose primary focus was procurement and contracting on a very large scale. The Contracting Directorate was responsible for ensuring that delivery orders and other contracts were executed for all of the Center’s programs. Since procurement missions involved mainly contracting work, there were several programs for which Contracting provided project management, including the Medical Acquisition Program and procurement for the Office of the Chief of Army Reserves and Army Housing Authority.

Procurement missions were some of the first the Center acquired beyond its support of the SENTINEL/SAFEGUARD system. Because of the experience the Center gained in procuring a variety of technical parts and equipment under short deadlines, as well as managing multiple contracts at one time, many organizations looked to Huntsville for help in managing very large procurement projects. One of the first was the U.S. Postal Service, which requested acquisition support for the construction of its Bulk Mail Centers in 1971. With more than twenty centers throughout the U.S., the project required incredible coordination with organizations and companies in several states. A later mission involved managing contracts for the Kingdom of Saudi Arabia from 1977-1981. The U.S. military had been providing aid to Saudi Arabia’s modernization efforts since the 1950’s, and because of the amount of work this involved, the

Corps required aid from an organization that specialized in contracting to manage the many contracts. The Center also supported the Army's Weapons Access Delay System in Europe, as well as projects for the Office of the Chief of Army Reserves and the Office of the Surgeon General.[1]

To accomplish these missions, the Center had developed a large and experienced contracting organization. Initially, the Contracting Directorate included a variety of divisions devoted to specific missions. The Medical Acquisition Division was responsible for procurement programs in support of the Office of the Surgeon General. The Environmental Acquisition Division supported chemical demilitarization, environmental, and ordnance programs. The Contract Services Division provided procurement support for training, automated systems, ballistic missile defense, and specific contracting problems for Huntsville Center. The Special Concepts Division primarily supported energy contracting, intrusion detection systems, and day-to-day procurement requirements of the Center, including the acquisition of computers and publications. As the Center moved towards team structures in 1995 and 1996, Contracting reorganized into three basic teams: ChemDemil Support, which met the complex contracting needs of the chemical demilitarization program; Acquisition Support, which supported the range program, automated systems, electronic security, utility monitoring systems, training, and telecommunications/computer support for Huntsville Center; and Acquisition Services, which provided procurement for the Medical Program, energy contracting, ordnance, environmental, and the Operation and Maintenance Engineering Enhancement Program. In addition to reducing managerial levels and improving communication, the teams allowed greater flexibility in shifting employees to adjust to changing workloads.[2]

In 1994, the Small and Disadvantaged Business Utilization Office (SDBUO) was moved to the Contracting Directorate. This important office helped Huntsville Center keep small and/or minority- and woman-owned businesses involved in its many projects. By providing contracting

advice, distributing information, and reviewing subcontracting plans, the SDBUO helped businesses that fit into categories defined by the Small Business Administration improve their access to the Center. Many of the Center's contractors became involved in the program with great success. In 1993, Colonel Brown lauded Burns and Roe Industrial Services Company for its use of small and disadvantaged businesses in construction of the BZ Chemical Demilitarization Plant in Pine Bluff, Arkansas. In 1996, Pennsylvania-based Huntsville Center contractor Human Factors Applications, Inc. was recognized by the Department of Defense as the best small business in the environmental restoration field, and by the federal government as the 1996 Small Business Prime Contractor of the Year. There were also important small business contracts for environmental remediation at the Stanley R. Mickelsom SAFEGUARD Complex at Nekoma, North Dakota, and at the Bone Third Party Site at Gadsden, Alabama.[3]

The type of work Contracting performed was soliciting offers, reviewing bids, evaluating proposals, and preparing and awarding a variety of contracts for complex equipment supply, construction, and architecture-engineering support. Most of these contracts were competitively negotiated and included cooperative agreements, incentive contracts, design/construct contracts, letter contracts, cost reimbursement, and others. Because of the paperwork and overhead this entailed – even for the smallest purchase amounts – a major goal in acquisitions was increased use of oral solicitations and credit cards. Regulation allowed use of government credit cards for any purchase under $25,000 with a goal of using credit cards for 90 percent or more of eligible purchases, a goal that the Center consistently met. Another major goal was increased automation. Contracting utilized a number of technologies to improve solicitations, such as the Internet and CD-ROM contracts. It also implemented the Standard Procurement System, which automated many contracting processes.[4]

Most of activities of the Contracting Directorate involved supporting the contracting needs of engineering or construction programs. Every program the Center supported had a

contracting element, whether design, procurement, service, or construction. In the case of chemical demilitarization, environmental, and ordnance programs, these contracts required many days of preparation and review because of the extensive and time-consuming nature of the work. The Contracting Directorate personnel were also responsible for general and specific contracting for Huntsville Center itself. They helped acquire computers, manuals, and telecommunication equipment for the Huntsville Center and related locations, such as the construction office at the chemical demilitarization plant site in Anniston Army Depot, Alabama. Acquisitions for the office of Information Management were vastly improved by simplified acquisition procedures and the use of government credit cards, which enabled Contracting to purchase needed computer equipment more quickly. Contracting arranged mail and messenger service for the Center by contracting with a JWD firm employing the severely handicapped. The Directorate was deeply involved in the implementation of the Corps of Engineers Financial Management System (CEFMS) through the procurement of workstations, LAN supplies, and audio/visual equipment. During the move in 1994, Contracting helped review contracts and arranged for the procurement of equipment for the new facilities.[5]

The Medical Program

The Center supported several programs that were primarily of a contracting nature, for which the Contracting Directorate provided project management. One of the largest was the Medical Program. In 1982 and 1984, Huntsville Center signed memoranda of agreement with the Office of the Surgeon General (OTSG) in which the Center would assume responsibility for providing specified items for Army and Air Force medical facilities worldwide. Among the items requested were furnishings of all types, medical and dental equipment, specialized imaging equipment, computers, and other items. They also helped manage architecture-engineering

contracts for the OTSG Health Facilities Planning Agency through the Corps of Engineers Medical Facilities Design Office. The program had several major aspects.[6]

One aspect of the medical program was procurement of ordinary furnishings and equipment for the renovation and construction of facilities at Nellis Air Force Base, Keesler Air Force Base, Fort Sill Army Hospital, Brooke Army Medical Center at Fort Sam Houston, and several other smaller hospitals and clinics. The Center provided specification review, purchase, procurement, shipping, and logistical support to these organizations, many of which it had been servicing for years. Items procured included furniture, draperies, artwork, dental chairs and lab equipment, sterilizers, surgical lighting, x-ray film processors, washers and dryers, radiotherapy simulators, computers, and many smaller items. The Center procured the majority of the furnishings from the Federal Prison Industries. These projects amounted to an average of $10-20 million annually.[7]

The Center also procured specialized equipment such as Magnetic Resonance Imaging (MRI), a state-of-the-art tool that produces digital images of soft tissue for medical evaluation. It is far more flexible and accurate than X-ray machines, but is expensive and bulky and requires special planning and installation expertise. The Center awarded the first MRI contract to General Electric Medical Systems in 1989, which ended in 1992 and totaled some $50 million. Two other MRI contracts were awarded to General Electric and Siemens, Inc. on March 9, 1994 amounting to $86.4 million. Over five years, the contractors were to purchase 18 MRIs, lease 10 others, and deliver and install the units and their accessories at military hospitals and clinics.[8]

[Figure 24: Magnetic Resonance Imaging]

Other major medical acquisition projects involved procuring Medical Diagnostic Imaging Support (MDIS) systems and Computerized Tomography (CT) beam scanners for the

OTSG. A technology that is not widely available in the private hospital sector, MDIS allows the creation, display, and transmission of medical images to computer workstations at medical treatment facilities, allowing for filmless medical image management. The initial contract was with Loral Corporation in 1991 for indefinite delivery requirements. In 1996, it became a tri-service project when the Center started supporting several Navy sites. Support for the CT Program began in 1992 when the Defense Personnel Support Center (DPSC) and U.S. Army Medical Material Agency requested Huntsville's technical expertise in relation to its OTSG mission. The program's purpose was to upgrade existing scanner systems in use at Army, Navy, and Air Force hospitals. Although DPSC managed procurement contracts, Huntsville Center provided engineering support through document evaluation, facility inspections, and site meetings. By the end of the contract period in 1995, the Center had participated in more than 20 CT projects.[9]

In 1989, the Center also became involved in supporting the design and construction of new and existing facilities for the OTSG. The Corps of Engineers Medial Facilities Design Office (MFDO) helped the OTSG Health Facilities Planning Agency provide architectural-engineering (A-E) plans for the construction of military medical facilities, but because of rapid growth in the project, MFDO started using indefinite delivery order contracts with civilian A-E firms to augment in-house design. In addition to reviewing in-house designs for MFDO, Huntsville Center was responsible for managing these contracts. Beginning in 1989, the Center awarded several one-year contracts to A-E firms to complete an indefinite number of short-term projects for MFDO. Among the projects completed were updating a computer-based cost-estimating tool, adapting designs to specific sites, conducting preliminary design studies, providing life safety system upgrades, and many others.[10]

After 1995, an increasing component of the Medical Program was aiding the repair and renewal of medical facilities for the U.S. Army Forces Command, the U.S. Army Medical

Command (MEDCOM), and the U.S. Air Force Medical Logistics Office. The objective of the repair and renewal program was to provide a simplified method of repairing, replacing, and renovating equipment or facilities. Huntsville Center provided contracting and technical services, including the management of a series of indefinite deliver/quantity contracts, that allowed quick response for repair and renovation of facilities. Because of the constant flux of facility managers through military offices, medical commands wanted a "toolbox" of contracting vehicles established for new facility managers to use. The Center developed the concept of using pre-approved commercial contractors allowing facility managers to request a task order for jobs based on a commercial work plan rather than a detailed design. This avoided a lengthy design contract solicitation, saving time and money. The Center awarded four such contracts on September 13, 1994, with each contractor responsible for providing an indefinite number of repairs in a defined zone over five years. Altogether, more than 281 task orders had been issued to acquire and install items such as lighting equipment, chillers, generators, fire alarms, roofing, and flooring, as well as to provide duct-cleaning and a variety of other less labor-intensive services. In 1997, the Center issued a new contract solicitation, and awarded four more contracts June 16, 1997 with a $500 million capacity. In a 1997 memorandum of agreement with MEDCOM, Huntsville Center was named the lead agency for the renewal program. A number of facilities initiated work plans, with an average project size of $2 million.[11]

By 1997, the Medical Program had changed in significant ways. BRAC had reduced the number of military construction projects, and most medical equipment was purchased outside of construction. Simple procurement missions were now being assumed by Medical Command to reduce overhead. From 1991-1995, Huntsville Center had provided extensive training in contracting to medical officers through a very successful intern program, and these interns carried considerable contracting experience to their duty stations. At the same time, after 1995 there was marked growth in repair and renewal contracts, which required engineering expertise

to review specifications. As a result, having program managers with engineering experience became more important, and management of the Medical Program passed to the Programs and Project Management Directorate. Nevertheless, contracting continued to be vital to the program. With the teaming concepts introduced to the Center in 1995, contracting specialists were assigned to the various Medical Teams and relocated to the Project and Program Management Directorate.[12]

Furnishings Procurement for the Army Barracks Renewal Program

In addition to the Medical Program, Huntsville Center also supported procurement and contracting for the U.S. Army and U.S. Army Reserves. On July 15, 1994, the Assistant Chief of Staff for Installation Management (ACSIM) signed a memorandum of agreement in which Huntsville Center would support the installation of furniture and furnishings at Army barracks and housing units worldwide, including the Barracks Upgrade Program. The Center provided a central procurement agency for all Army installations worldwide. Huntsville contracting specialists assisted the ACSIM to prepare annual budgets, develop specifications, evaluate and award supply and services contracts, and manage delivery to coincide with a facility's beneficial occupancy date. They would also evaluate the program to constantly implement lessons learned. From 1995-1997, the Center processed approximately 200 requisitions per year at a cost averaging two percent of the contract obligation amount – as much as $800,000 for some years.[13]

[Figure 25: Barracks Furnishings]

In a memorandum of agreement with the Office, Chief of Army Reserves (OCAR) in 1987, the Center agreed to provide contracting support for all new and renovated facilities,

manage funds received in support of OCAR projects, and establish policies and procedures for acquiring supplies and services for the Reserve Centers. The majority of these acquisitions involved furniture and furnishings, for which the Federal Prison Industry was the primary supplier. Over the years, the Center has procured $24 million in furniture and furnishings for more than 32 sites around the country, including $5 million in furniture for the Reserves headquarters facility in Atlanta, Georgia. By early 1997, more and more acquisitions for OCAR required technical support and day-to-day management, including repair, renewal, and operation and maintenance work, and the program was transferred to the Corps of Engineers Louisville District that fiscal year to improve coordination of the program and thereby lower costs.[14]

The Contracting Directorate performed vital procurement and contracting functions in many of Huntsville's programs, as well as supporting the Center's own contracting needs. Contracting also supported important procurement missions for the Office of the Surgeon General, the Assistant Chief of Staff for Installation Management, and the Office, Chief of Army Reserves. Altogether, these projects amounted to millions of dollars in contracts, and the Medical Program ranged from 6.5 to 11 percent of the Center's annual budget, running in excess of $58 million most years. To accomplish these extensive and complicated missions, the Center worked hard to reduce the cost and increase the speed of acquisitions through innovative contracting methods. Because of its success in streamlining the contracting process, the Energy and Medical Programs were nominated for consideration for the 1997 Secretary of the Army Team Award for Excellence in Contracting.[15]

IX.

Partners in Conservation:

Energy and Fuel Programs

For several decades, Huntsville Center had been involved in programs related to energy and fuel. Initially, these programs concentrated on the technical aspects of fuel conversion and management, but over the years, Huntsville became tasked with many conservation programs to reduce energy use throughout the military using automated systems such as the Utility Monitoring and Control System and innovative contracting such as the Shared Energy Savings program. Because of the contracting expertise of personnel at Huntsville Center, the contracting programs showed particular promise, and in 1997 Huntsville's energy team was recognized by the Secretary of the Army for excellence in contracting.[1]

The Center's involvement in energy programs began in 1975 when the Energy Research and Development Administration, later part of the Department of Energy (DOE), signed a memorandum of understanding with Huntsville Center to provide technical and administrative support for the coal conversion program. In this program, the Center helped support research and demonstration of processes for converting coal into cleaner fuels. Center engineers developed designs for two plants, but Congress decided to cut the program. Nevertheless, several new energy missions followed. In 1977, Huntsville became involved in designing and managing the construction of the DOE's Pantex nuclear munitions plant in Amarillo, Texas, a facility that required highly technical designs. By 1979, the Center was supporting the DOE's Strategic Petroleum Reserve, whose purpose was to conserve energy usage through better fuel management. That same year, the Army introduced several programs involving energy

conservation, for which it asked Huntsville Center's support. Although the Center continued to be involved in coal gasification and fuel conversion well into the 1980s, conservation programs – most of them concerning innovative contracting – became Huntsville's primary energy focus.[2]

Utility Monitoring and Control Systems

One of Huntsville Center's earliest programs that contributed to energy conservation involved Utilities Monitoring and Control Systems (UMCS), formerly called the Energy Management and Control Systems. A UMCS is a centralized computer system that reduces energy use by controlling and monitoring a building's lighting, heating, cooling, and ventilation. Assigned as Mandatory Center of Expertise (MCX) and Design Center of UMCS in 1979, Huntsville engineers were responsible for site inspections, system design, delivery, installation, training, and specification development for the UMCS. An MCX is an organization that provides technical expertise for projects on a mandatory basis. In this capacity, Huntsville Center engineers completed a technical manual and guide specifications, including specifications for multi-building expansions of existing systems. The MCX held 42 UMCS design courses from 1980 to 1993 as part of the PROSPECT program. The MCX engineers also actively supported the UMCS program in Europe with the development and guidance of European-specific documents and training courses. To simplify communication with customers and improve review of the design criteria, in 1993 the MCX helped develop a list of technical coordinators from each Corps of Engineers District and Division who would help coordinate the program.[3]

As UMCS Design Center, Huntsville Center was responsible for supporting UMCS installation, including projects such as providing designs for the Navy Center for Public Works in San Diego and helping plan the Energy Monitoring and Control Systems portion of a

renovation of the Pentagon. Interest in UMCS continued to expand during the 1990s, and the number of systems installed has grown considerably. Since 1992, Huntsville had helped Forces Command (FORSCOM) manage its UMCS program as well, providing UMCS design and technical assistance for hospital construction at four Army posts, and designing three postwide systems at Fort Hood, Fort Stewart, and Fort Carson. Most of these installations are handled through indefinite delivery, indefinite quantity contracts that allow quick and cost-effective delivery of UMCS for any U.S. agency at any location worldwide. These contracts are parallel to Energy Savings Performance Contracting (see ESPC below).[4]

Energy contracting programs

Several energy programs Huntsville Center supported attempted to conserve energy through innovative financing contracts. One of the earliest contracting programs concerned with energy conservation was Third Party Contracting (TPC). This program allowed government agencies to enter into contracts with a financier and the builder/operator (hence the name third party contracting) for the purchase of services. After issuing a 30-day notification to Congress, the TPC contractor would design, build, own, and operate facilities on government land to provide the service. Part of the program was not energy related and included contracts for a variety of facilities, such as some wastewater treatment facilities that Huntsville supported. The energy component was used primarily for providing utilities on military installations, including steam plants and electrical services. In 1983, the Headquarters of the Corps of Engineers tasked Huntsville Center to support the issuance of TPC contracts by conducting technical reviews and preparing requests for proposals and evaluating proposals. The same year, Headquarters designated Huntsville as Center of Expertise for the program. In 1986, the Military Construction Codification Act (PL 97-214) was amended to require that all new heating systems on military

property use the most cost-effective fuels. Unfortunately, provisions included in the Tax Reform Act of 1986 (PL 99-514) eliminated tax incentives, thereby reducing the economic feasibility and desirability of TPCs. Interest in the program quickly waned, and by 1995 no new projects were foreseeable in the U.S.; although, this type of contract remained very popular in Europe.[5]

A more successful contracting program was Demand Side Management (DSM). DSM permits government facilities to enter into contracts with utility companies or subcontractors to reduce demand for electricity. The companies help the government select services and equipment that reduce demand. Both the government and the utility benefit: the government has more money to spend on energy goods and services, while the utility receives enough of a reduction in services that it reduces the need to build additional costly, new power plants. In essence, utilities purchased a reduction in services. Following assignment as the Center of Expertise for DSM in 1991, Huntsville Center developed a management plan, a project database, and a training program. By 1993, FORSCOM had requested Huntsville's help with negotiating DSM contracts with a number of utilities, including possible rebates for installing energy-efficient lighting or natural gas-powered chillers. When several of these projects did not appear feasible, program managers at Huntsville realized they still had a lot to learn from the program. Some of the projects were workable, however, and by 1995 DSM projects were under consideration for Fort Bliss, Texas, and Fort Irwin, California. Eventually, a highly successful DSM contract was put in place at Fort Irwin in 1995, but there was little activity in this program after 1996. Although utilities were favorable to DSM, most military customers preferred Energy Performance Savings Contracts because they offered significant rebates, while DSM offered little incentive.[6]

Another energy contracting program was the Energy Conservation Investment Program (ECIP). ECIP was designed to save energy and reduce Defense Department energy costs through the construction of high-efficiency energy systems or improvements to existing facilities.

Because Executive Order 12759 and recent Department of Defense directives emphasized energy efficiency, the Army encouraged installations to use ECIP and other conservation programs in order to meet its goal of reducing energy consumption by 30 percent by the year 2005. Unfortunately, although Congress and the executive branch appeared to be committed to energy savings and increased funding for ECIP, most installations lacked the manpower and expertise to develop the necessary documentation for the program.

Since Huntsville Center had shown great success with energy contracting, several major commands and installations requested Huntsville's assistance in investigating, evaluating, and developing DD1391 documentation for ECIP beginning in 1991. Initial participants in the program included FORSCOM, the Military District of Washington, Fort Bliss, Fort Bragg, Fort Hamilton, Fort Indiantown Gap, Fort Jackson, Fort McNair, Fort Dix, Fort Stewart, and others. Project requests included providing or upgrading gas-burning generators, boilers, and motors; improving lighting, providing weatherization, installing a UMCS, replacement of condensers, and so forth. The primary function of Huntsville Center for ECIP was preparation of the DD1391 documentation using the 1391 processor, though in many cases a site visit was required for Center personnel to gather information and evaluate the feasibility of projects. Army funding of ECIP continued to increase in the early 1990s, leveling off at around $20 million. However, the program was transferred to the management of Mobile District in late 1993, and by 1996 funding expired.

Energy Savings Performance Contracting

Huntsville Center's most successful energy program was Energy Savings Performance Contracting (ESPC), formerly called the Shared Energy Savings (SES) program. The SES program attempted to reduce energy spending through contracts in which the contractor would

provide, modify, or operate a facility in a way that reduced energy consumption. The government and the contractor would then share the resulting savings. While the contractor receives a large portion of the savings to offset any capital investments, the government also receives a portion of the savings, as well as reduced energy consumption and new energy systems to replace aging equipment. Since 1984, Huntsville's energy team managed a pilot program involving six test sites, for which they developed contracting procedures, methods of calculating baseline energy consumption, as well as software to aid in the complicated accounting process used to determine savings. Huntsville Center awarded the initial contract in September 1988, and the work for the pilot was complete at all sites by 1991. As a result of this success, the Corps of Engineers designated Huntsville as the Technical Center of Expertise (TCX) for SES in 1990 with the responsibility of assisting the execution of SES projects.[8]

Beginning in 1990, dozens of military installations requested Huntsville's help with energy projects ranging from facility operation and maintenance or replacement of equipment such as water heaters to conversion of fuels to natural gas or research into alternative power sources. The majority of the funding over the years came from FORSCOM, though the work concerned many installations. For example, in one contract with Co-Energy Group of Santa Monica, California, the Huntsville Center energy team estimated that renovation of family housing units at Fort Polk, Louisiana, would result in energy savings worth $44 million over 20 years, with the Army receiving 22.5 percent of the savings or $9.9 million. Similar projects were initiated by Fort Lewis, Fort Stewart, Fort Irwin, and many others. As a result of the significant savings resulting from these and other contracts, the Department of Energy selected 13 energy team members to receive Federal Energy and Water Management Awards in 1995.[9]

[Figure 26: Energy maintenance under ESPC]

From 1993-1997, several significant changes took place in the program. Congress renamed the program Energy Savings Performance Contracts (ESPC) in the 1992 Energy Policy Act (PL 102-486), though the program continued to be referred to as SES for some years. Also, in 1993 Huntsville Center began investigating and implementing base-wide solicitations for FORSCOM at the Barnes Building in Boston, Massachusetts, and the Strategic Air Ground Environmental Complex in Syracuse, New York. Basewide contracts were also awarded for the West Point Military Academy, Fort Huachuca, and Marine Corps Base, Hawaii. Each solicitation was for multiple installation-specific contracts that allowed contractors to identify possible conservation measures and then apply to execute them. By 1994, the Center had implemented procedures provided by the U.S. Army Center for Public Works to pre-qualify firms to perform the energy conservation services. The goal was to have a list of available contractors to make awarding contracts easier and faster. After receiving contract statements, a Qualification Review Board met in Huntsville in September 1994 to evaluate statements and create a list of available contractors for the Department of Defense. Subsequent boards met in 1995, 1996, and 1997 to update the list.[10]

Huntsville personnel issued the first two base-wide contracts with prequalified contractors in late 1995. The projects were so successful that in 1997 the Center expanded the concept and issued 25-year, unlimited delivery order solicitations to seven contractors working in a four-state area. Any time a government facility in Virginia, North Carolina, South Carolina, and Georgia wanted to implement energy-saving measures, they simply put in a request with a description of the desired work. A team of engineers and contracting specialists at Huntsville Center then reviewed the request and potential contractors, and chose an appropriate contractor. Once the customer approved the choice, the Center issued a task order to perform the work. The contractor then received payments from verified savings each month. These contracts covered not only new facilities and renovations, but also operations and maintenance repairs that

involved upgrading to more efficient equipment. The initial reaction to this program was very strong, and by the end of 1997, Huntsville Center had awarded a second billion dollar solicitation to eleven contractors for the remaining 48 states, Washington D.C., and Puerto Rico.[11]

The results of using multistate solicitations with prequalified contractors were significant cost and time savings. By avoiding the need for costly review and management of contracts for each individual project, ESPC reduced the cost of awarding a contract from $140,000 to $100,000, a saving of $40,000. And while site-specific contracts could take as long as 24 months to prepare and award, under ESPC the contracts were awarded within six to eight months. In recognition of the value of the program, the Department of Defense allotted $4 million to help bring in new customers. With these funds, customers paid no service fee. At no cost to themselves, military organizations received equipment upgrades and energy savings, making it in their best interest to participate in the program.[12]

Maintenance, Repair, and Rehabilitation

The Maintenance, Repair, and Rehabilitation (MRR) contracting program addressed the need to provide quick, flexible responses to operation and maintenance problems at government installations. In 1992, after FORSCOM brought attention to the difficulties in getting quick responses for facility operation and maintenance, Huntsville Center contracting experts developed the method of using ready-made MRR contracts. Parallel to the medical repair and renewal "tool box" contracts (see Chapter Eight), MRR contracts allow government agencies to initiate task orders with commercial contractors to replace or repair failing energy systems or upgrade to more efficient technologies. The contractor prepares a commercial work plan, which can be quickly approved and implemented, resulting in considerable timesavings. In May and June 1997, the Center issued three five-year indefinite delivery/indefinite quantity contracts to

Noresco, Siebe Government Services, and Vanguard Contractors to provide MRR services on government installations in the continental U.S., Alaska, Hawaii, and Puerto Rico. By the end of the year, funding levels had increased to an average of $20 million a year.[13]

The MRR contracts allowed installations to save as much as five percent on facility maintenance costs, but perhaps the most impressive aspect of the MRR contracts was how much more quickly they allowed government agencies to implement equipment repairs. By cutting out the lengthy contracting process, installations could have repairs made within 45 days – 200 days less than with using traditional contracting methods. In the case of one Army Reserve unit in Athens, Georgia, the contractor replaced a boiler within a record-setting five hours of receiving a request. Many times, having to wait for weeks for a simple repair is extremely inconvenient, such as when an air conditioner at Fort Stewart, Georgia, broke down just prior to Independence Day 1996. In these cases, MRR made very personal contributions to quality of life. The ultimate reason for the program's success, according to program manager Bob Starling, was simple: "It's not only our program, it's our philosophy. . . . We keep trying to find ways that the installation can always afford the kind of service that a private customer gets."[14]

Privatization

Another energy effort Huntsville Center supported was utility privatization. The Army lacks the manpower and financial resources to modernize utilities in compliance with industry standards and stringent environmental laws, which greatly increases the likelihood of serious accidents. One means of providing reliable services is to transfer the ownership, maintenance, operation, and responsibility for upgrading and replacing government-owned utilities to non-federal entities. The Department of the Army's goal is to privatize all government-owned utility systems by January 1, 2000. Since June 1995, Huntsville Center has managed contracts for a

number of FORSCOM installations to provide feasibility studies investigating the potential of privatization of utility systems. The contractor reviews the proposed system, and if the cost to transfer the utility is economically feasible and the installation requests support to prepare a formal solicitation, Huntsville Center issues a request for proposals to the private sector. By the end of 1997, 15 installations had requested Huntsville Center's support.[15]

Fuel management

Although contracting programs such as EPSC, MRR, and privatization were the largest part of Huntsville's energy work, the center was also involved in energy conservation through the management of fuel. As early as 1979, the Center had been involved in fuel management through the Department of Energy's Strategic Petroleum Reserve. Since 1993, the Center has supported the fuel management efforts of the Defense Fuel Supply Center (DFSC), a component of Defense Logistics Agency. DFSC is responsible for managing storage and distribution of petroleum products for the Department of Defense, including the management of government-owned, contractor-operated fuel terminals. In order to maintain these facilities in compliance with Federal, state, and local regulations, DFSC requested support from the Corps of Engineers in developing pipeline operations manuals to be used in the Continental United States, Alaska, Spain, and Cuba. In August 1991, the Headquarters of the Corps assigned Huntsville Center as project manager.[16]

In the process of developing emergency procedures, operation procedures, and related training for DFSC, Center personnel performed aerial surveys, analyzed probable hazards, determined as-built conditions, and collected historical data for the pipeline area. In the case of one DFSC site at Charleston Air Force Base, South Carolina, the Center's team had to manually trace underground JP4 fuel lines because no one could remember where they were located. To

help with the program, Huntsville Center contracted Fluor Daniel in April 1992 and the Ralph M. Parsons Company in July 1993. By 1995, DFSC had assigned a total of 14 Defense Fuel Supply Points to the program, and Huntsville Center had proceeded rapidly in developing the manuals. By the end of 1995, aerial surveys had been conducted on 10 sites, and Huntsville had released manuals for eight sites. The remaining manuals were released in 1997 except for the Defense Fuel Supply Points in Cuba and Spain, which were in progress.[17]

[Figure 27: Presentation of the 1997 Hammer Award]

By the end of 1997, Huntsville Center had made an incredible difference in energy programs. Center engineers had long been recognized as experts on such highly technical fields as designing and installing Utility Monitoring Control Systems and managing complicated contracting processes for Demand Side Management, Energy Savings Performance Contracts (ESPC), and Maintenance, Repair, and Rehabilitation. The Center proved it could provide innovative solutions that dramatically reduced the cost and time associated with contracting programs. The ESPC program worked so well that in 1997 the Department of Energy selected Huntsville energy team members to again receive the Federal Energy and Water Management Award for work at West Point, Fort Huachuca, and Hawaii. Then the energy team received an even higher recognition when Vice President Al Gore awarded them the Hammer Award, which recognizes efforts that "hammer away" at unnecessary bureaucracy and inefficiency. As Energy Team leader Bob Starling noted, in a time of downsizing, such programs are essential because they "save money that can then be used for other programs that substantially affect their missions."[18]

X.

Engineers for the Nation:

Design – Forces Support

Since its inception, Huntsville Center has provided designs and design criteria for a wide range of highly technical programs. At the beginning, these designs were related solely to missile defense, but as the Center expanded its mission, it became involved in numerous design projects in support of U.S. military forces and government facilities – including Major Commands (MACOM) and operational forces deployed worldwide. Although these activities covered a wide range of interests, from updating criteria documents and facility plans to designing ranges, intrusion detection systems, and automated systems, these programs had in common a national scope and an incredible complexity.

The majority of the Huntsville Center's design activities were in support of Major Army Commands (MACOMs), including the U.S. Army Forces Command, the U.S. Army Missile Command, the U.S. Army Intelligence Command, the U.S. Army Training and Doctrine Command, as well as organizations such as the Corps of Engineers, the Department of Energy, the Defense Logistics Agency, and major military installations. Many of the design activities were related to the Center's major programs and product lines, including engineering automated system design, environmental remediation and contracting, energy reduction, and utility monitoring and control systems. Other design programs, though they individually constituted a small percentage of the Center's dedicated resources and funding, nevertheless fulfilled uniquely critical missions for military customers related to the standardization and modernization of highly technical facility designs. These include production base support, range design, operation

and maintenance support, criteria document updates, intrusion detection system design, and building design or contract management for a variety of organizations.[1]

Production Base Support

One of the oldest design programs Huntsville Center supported was the Production Base Support (PBS) program. In the early 1970s, the Army Materiel Command (AMC) initiated what was then called the Munitions Production Base Support Construction Program to modernize and expand munitions production facilities while addressing safety and environmental concerns. It included two sub-programs: the Modernization and Expansion program and the Production Support and Equipment Replacement program. In 1973, AMC requested Huntsville Center's support for the program, primarily because the program covered a large geographic area, required extensive contracting experience, and involved the design of blast-resistant and otherwise highly technical facilities. The Center became responsible for program management and project design for all new sites, for projects with process systems common to more than one site, and for technically complex projects. Before 1988, PBS was Huntsville's largest mission, involving the redesign of 26 Army ammunition plants and four arsenals, but with reorganization and budget cuts after 1988 and the resulting reduction in the PBS program, many tasks were transferred to other organizations.[2]

Despite reduced funding, Huntsville Center continued to be involved in the PBS program for several years. In addition to its continued design responsibilities, as Corps of Engineer program manager the Center was responsible for planning, scheduling, reporting, financial management, monitoring design and construction status, criteria and design review, and configuration management. Corps of Engineers districts were responsible for actual construction and design. In 1995, there were 20 ongoing construction projects with funding at approximately

$16 million, and there were more than 80 projects under design. That year, a memorandum of understanding between the newly created Industrial Operation Command and the Deputy Chief of Staff for Industrial Readiness (DCSIR) divided responsibility for PBS with the majority of program responsibility going to DCSIR. After this time, Huntsville Center's role was largely administrative, involving supporting transition of the program to DCSIR.[3]

The Range and Training Lands Program

Another major, long-running, standardization and design program that Huntsville Center supported was the Range and Training Lands Program (RTLP), which existed to modernize and standardize training ranges for the Army, Army Reserve, and the National Guard Bureau. In the spring of 1981, Training and Doctrine Command determined that many ranges were inadequate, so it created the Director for Army Ranges and Targets (DART) to execute RTLP. In the fall of that year, DART signed a memorandum of understanding with Huntsville Center to support the program, and the Headquarters of the Corps of Engineers designated Huntsville as Center of Confidence, with responsibilities to support standardization of designs, assist in site planning, and develop programming documentation. Because of the Center's success in these duties, Headquarters named Huntsville Mandatory Center of Expertise for RTLP in 1987, and signed a memorandum of understanding with the United States Marine Corps and the Navy Facilities Engineering Command designating Huntsville Center as design agent for all Marine Corps ranges in 1990.[4]

[Figure 28: Range construction]

The Center supported RTLP by participating in predesign conferences, developing design manuals and documentation, reviewing designs, and conducting inspections of range construction sites. Corps of Engineers districts performed the fieldwork and conversion of maps to a digital format required for manuals and range designs. One of the Center's primary responsibilities was to develop, test, and maintain a knowledge of technological advancements related to range modernization, such as automated range design and control systems, as well as provide user training for these systems. The Center developed specialized software to analyze line-of-sight, target visibility, and target applicability for qualification training used on all armor ranges worldwide. A major application fielded by Huntsville personnel was the Range Facility Management Support System (RFMSS), which allows users to control day-to-day range operations in a Windows environment, including functions such as scheduling, limiting range access, and keeping firing records on individual performance.[5]

The Center participated in numerous range projects. Since 1984 when construction on ranges at Fort Hood and Fort Bliss, Texas, and Fort Riley, Kansas, began, more than 400 ranges have been built, including 12 Marine ranges designed in Huntsville. Among the more notable sites the Center helped support were the Pohakuloa Training Ranges in Hawaii – an early test site of RFMSS – and multiple ranges at 29 Palms U.S. Marine Corps Base in California. Also, because of requirements that tank ranges undergo a line-of-sight analysis using the Range Analysis System, the Center conducted more than 25 analyses. The Center tracked each project using a database of lessons learned, enabling Huntsville personnel to continually improve design criteria and internal processes. [6]

Electronic Security Systems

Another important design service Huntsville Center provided for major commands concerned electronic security systems: intrusion detection systems (IDS), entry control systems, closed-circuit television systems, data transmission systems, and other highly sophisticated security devices. In 1981, the Defense Nuclear Agency asked the Center to design a state-of-the-art facility with intrusion detection capabilities, which the Center successfully completed. Over the next few months, the Center became involved in the Army's IDS program, and in 1983, the Headquarters of the U.S. Army Corps of Engineers designated Huntsville Center as Mandatory Center of Expertise and Design Center for IDS, which was later renamed the Electronic Security Center because Huntsville's expertise covered all forms of electronic security. In 1984, Headquarters approved the Program Management Plan, which was last revised in November 1997.[7]

[Figure 29: Electronic Security Systems]

Encompassing the duties of both Mandatory Center of Expertise and Design Center, the Electronic Security Center was responsible for performing installation surveys; defining research and development needs; conducting special studies; developing system criteria; designing systems; procuring, installing, and initializing systems; coordinating special work requirements; and performing predelivery, performance verification, and endurance testing. The Electronic Security Center's primary responsibilities for Headquarters were research and development of criteria documents such as guide specifications and technical manuals, though it also prepared and conducted both proponent and Army sponsored training in the U.S. and Europe. The Center also provided engineering support to the Physical Security Equipment Management Office, an agency responsible for providing security throughout the Army, and helped the Protective Design MCX with security portions of their projects. On request from Major Commands, the Electronic

Security Center would conduct site surveys and design systems. These design projects encompassed activities from project site surveys to delivery of a completed design package and procurement of the system, and usually involved the services of a contractor. In 1991 and 1995, the Center awarded procurement and installation services contracts to Kiewit Network Technologies and architect-engineer contracts to C.H. Guernsey and Company.[8]

Over the years, security experts at Huntsville have supported a wide range of projects for numerous government agencies. They have completed more than 100 surveys and supported the procurement and installation of more than 50 systems worth some $15 million. After providing intrusion detection systems for the 1984 Olympics, they provided similar services for the 1987 Pan American Games and the 1990 Goodwill Games. They conducted an exterior White House security study, and supported projects at the Smithsonian Institute, the Bureau of Land Management, and the Immigration and Naturalization Service, as well as provided design review and construction oversight for security systems at the Bureau of Engraving and Printing's Western Currency Facility in Fort Worth, Texas. And the Center provided security systems for many installations, including Fort Belvoir, Virginia; Fort Riley, Kansas; Heidelburg Airfield, Germany; and 225 California National Guard Armories. Since 1995, the Electronic Security Center has awarded more than 60 delivery orders through C.H Guernsey and Company.[9]

Of these many missions, three have been particularly significant. Since construction of the Johnston Island Chemical Stockpile Disposal Plant in 1989, Huntsville Center has designed security systems at all chemical demilitarization facilities, including perimeter security designs at six installations: Tooele, Utah; Pueblo, Colorado; Umatilla, Oregon; Richmond, Kentucky; Anniston, Alabama; and Pine Bluff, Arkansas. Contractors conducted site survey validation and concept design, followed by final system designs. After system installation at Tooele, Anniston, and Umatilla, the Center participated in performance testing of the systems. For several years, the Electronic Security Center also supported installation of dozens of Integrated Commercial

Intrusion Detection Systems, including testing of the first such system at Fort McClellan, Alabama. Perhaps the highest profile security design projects involved several highly sensitive buildings in Washington, D.C. The Pentagon requested IDS designs for several of its facilities, including the Navy Annex, Headquarters of the Defense Nuclear Agency, Pulaski Building, Hoffman and Ballson Towers, the Defense Protection Service Buildings, and the Pentagon itself. The systems were composed of badging equipment, motion sensors, cameras, intercommunication equipment, and other security devices, and were designed by A-E contractor, C. H. Guernsey.[10]

Other design projects

Huntsville Center also coordinated several other design projects, primarily through contractors. One customer that the Center supported was the U.S. Army Intelligence and Security Command (INSCOM). In December 1989, INSCOM requested the Center's assistance with enhancing its facilities around the world. The program had three aspects: developing designs and design criteria, developing security systems similar to IDS, and improving power reliability through the protection of utilities. These projects involved construction, maintenance, and repair, as well as preparation of studies, reports, and project requirements. Nearly all of this was accomplished through contractors. As Technical Manager for the program, the Center identified projects, developed criteria, monitored progress, reviewed designs, and procured equipment. Although the number of requests was not great, INSCOM continued to send delivery orders, and on September 18, 1995, the Center awarded an indefinite delivery order contract to Black and Veatch to replace the initial contract that expired in 1994. Since that time, however, no new contracts have been issued because the number of projects diminished.[11]

Another important design mission was for the U.S. Army Engineer Topographic Laboratory (ETL). ETL supplies tactical topographic data – cartographic analyses and tactical documents – to Army Commanders, the Joint Chiefs of Staff, and other agencies, which they use to evaluate the effects of terrain and man-made facilities on Army field operations. Huntsville Center has supported ETL since 1977 by selecting architecture-engineering firms, awarding contracts, processing payments, and modifying contracts (if necessary) for the preparation of stable base film overlays for the topographical analyses, as well as other cartographic/engineering services. ETL provided technical guidance, reviewed submittals, and from 1990 was responsible for security. By 1993, 39 projects had been awarded. After 1995, however, no new requirements had been identified.[12]

The Center also supported a variety of smaller design programs. Since 1985, the Architectural Branch of the Center's Directorate of Engineering had supported the Army Facilities Standardization Program. Headquarters had created this program to support the Department of the Army with providing standard designs for a number of types of facilities. Designated Centers of Standardization within the Corps of Engineers were assigned specific facility designs to develop and maintain. The Center was responsible for five standard designs: child development centers, fire stations, physical fitness centers, hazard storage facilities, and a close combat training facility. This was more standard designs than any other Corps organization. Additionally, the Service Branch of the Cost Engineering Division is the approved repository for the standard designs. Government and non-government agencies use this repository to obtain standard designs for project adaptations.[13]

Criteria Documents Update Program

In addition to preparing and reviewing designs, Huntsville Center was responsible for preparing design criteria and guidance through the Criteria Documents Update Program (CDUP). The Corps of Engineers maintains a large inventory of criteria documents, including guide specifications, technical manuals, and standard designs, that help provide uniform guidance for design of Army facilities. Because of changes in technology, engineering materials, construction techniques, equipment, and the design process, it is necessary to update these documents from time to time. The purpose of CDUP is to maintain criteria documents and develop new criteria as needed, and, through the Notice Program, to continuously update and distribute the guide specifications, so contractors will comply with the latest industry standards for all military construction. In 1978, Headquarters assigned CDUP to Huntsville Center. The Center was responsible for conducting research, preparing draft criteria, coordinating with industry and Corps of Engineers reviewers, awarding A-E contracts, providing technical review, finalizing criteria, and in general administering and managing the program.[14]

The program proceeded smoothly, with 12-22 contracts being awarded annually to accomplish a variety of update tasks. In 1993, Headquarters tasked Huntsville Center with converting the Corps of Engineers Guide Specifications to metric measurements. About 320 guide specifications had been converted by the end of the year. Also in 1993, as part of the Army's Seismic Risk Mitigation Program, the Center selected a contractor to evaluate seismic effects on design criteria. In 1994, the Center completed guide specifications and technical manuals that included new criteria to end use of lead-based paint, and conducted several workshops to convey the changes to the Corps divisions and districts. After 1995, with continued reductions in the federal budget, project funding declined. However, there was an increase in the number of projects requiring technical expertise, so that the overall funding for CDUP remained steady. Since the technical staff at Huntsville had a reputation for technical expertise, cost effectiveness, and schedule compliance, Headquarters requested that more

projects be performed in-house at Huntsville to better use program funding. The number of projects completed in-house grew from 35 percent to 60 percent during this time.[15]

One of the Center's goals from 1993-1997 was to improve automation. Given the amount of information related to the program, it was essential to increase electronic communication, from project coordination, to criteria draft reviews, to approval and distribution of the final product. Using the Internet, the CDUP team was able to dramatically speed the approval process and the dissemination of criteria updates to the field. By 1997, field access to criteria was fully electronic. Another major goal of the CDUP team was to try to increase its own industry expertise in order to improve in-house services. This required that the staff at Huntsville keep current with construction trends and legislative actions. As with any industry, the managers of the program understood that once customers knew and appreciated the Center's available expertise, they would continue to request projects. As a result of increased in-house capabilities, CDUP funding increased sharply after 1996.[16]

Operation and Maintenance and Engineering Enhancement

One program to which Huntsville Center brought considerable expertise was the Operation and Maintenance Engineering Enhancement (OMEE) program. In 1982, the Chief of Engineers formed a panel to investigate management of construction quality in the Corps of Engineers. The panel's 1983 report found that four of the five most frequent customer complaints were related to post-construction operation and maintenance (O&M). Traditionally, architect-engineers designed complex facilities, then handed them over to the owner, who lacked knowledge of how to efficiently operate costly equipment. To address these concerns, the Headquarters of the Corps of Engineers initiated OMEE, which sought to "ensure that when a complex facility becomes operational, everything necessary for proper transition and assumption

of O&M responsibilities ... is in place, on line, and ready to go." Its goals were to create an environment where, through proper maintenance, a facility could attain its design intent, and its equipment reach full life expectancy. The Center's initial tasking was to develop a comprehensive O&M Transition Guide applicable to complex construction projects, detail the development of O&M documentation, provide training documentation, and address O&M responsibilities. As the program expanded, the Center used a broad range of engineering studies and surveys to develop documentation such as O&M manuals, concept manuals, master equipment lists, and installed equipment inventories; O&M management plans, including staffing plans, training plants, preventative maintenance plants, budget estimates, contract plants, and service contract documents; and facility O&M assessments and deficiency listings. On December 15, 1992, the Corps designated Huntsville as the Technical Center of Expertise for OMEE.[17]

In 1989, the Center initiated a pilot project involving a health care facility in Wurzburg, Germany, where it tested use of a contract option requiring the contractor to assume responsibilities for O&M during the first two years, thereby allowing operators time to learn proper maintenance techniques. By 1997, the Center had supported more than 70 installations with hundreds of projects, and OMEE funding was in excess of $12 million. The vast majority of these projects were medical facilities with complicated equipment that required constant maintenance, but the Center also supported training facilities and a wastewater treatment plant. Initially, most of these projects consisted of OMEE options in construction contracts, preparation of O&M concept manuals, and facility assessment for multiyear repair plans. As new construction declined with dwindling resources after 1995, most projects involved enhancing maintenance at older, used facilities.[18]

OMEE expanded considerably over the years. In 1992, the OMEE team prepared the Blue Book and Green Book – typical O&M manuals for twenty different types of equipment used

by the Air Force and Army respectively. In 1993, they developed typical O&M staffing manuals, which included organizational charts and the number of employees required to upkeep several types of systems. The Center distributed more than 100 copies of these manuals. By 1997, the OMEE team was supporting air quality control system installation and Year 2000 compliance, which involved the correction of computer programs to avoid malfunctions at the millennium due to using two-digit date fields in computer code. OMEE had also given birth to some of the Center's most popular maintenance programs, such as supporting the Defense Fuel Supply Center and developing Medical and Energy "tool box" contracts (see Chapters Eight and Nine). Eventually, however, OMEE came to focus on five product lines: O&M planning, O&M design, simplified facility support, repair and renewal, and Year 2000 compliance. Contractors provided the majority of the work: AE contractors in the case of O&M planning and design, and service contractors in the case of the other services. For OMEE experts at Huntsville, the biggest labor was changing people's mindset by refocusing their attention on reducing long-term cost through better facility operation and maintenance.[19]

One of the most important developments in OMEE was the Simplified Facility Support Process, a method developed in Huntsville for streamlining traditional design and construction methods to meet the requirements of operations and maintenance work. Maintenance and repair of existing facilities rarely requires the same depth of design as large-scale construction projects. To avoid excessive costs and review time, Huntsville engineers incorporated methods used in the private sector. The Center developed a series of indefinite delivery/indefinite quantity service contracts covering broad programmatic or geographic areas. When a facility identifies a maintenance/repair need, the Center issues a task order for a work plan. Rather than developing a complete set of specifications, the contractor produces a concise plan using shop drawings, catalog cuts, and manufacturer instructions to describe the work. After review by the Center and the government, the job is accomplished under the local supervision of the installation or local

Corps geographic districts. These methods have proved extremely successful, blossoming into the popular Medical and Energy programs. In 214 medical projects, the simplified facility support process has reduced costs by more than 15 percent while reducing the time from the bid to the notice to proceed from 240 to 120 days. Likewise, Energy projects have saved more than 20 percent on costs and more than 80 percent on project time. The net result was millions of dollars saved for the Center and its customers. [20]

Mobilization and readiness

The Center's other major line of design projects supported U.S. operational forces around the world. In order to facilitate the deployment of American troops, Huntsville Center provided design and acquisition services to the Army, Army Reserve, National Guard, the Marine Corps, and other Major Commands. Many of these programs have been discussed previously: medical equipment acquisitions, design and installation of Intrusion Detection Systems, and training range design. However, a key service to operational forces involved the development of standard, quickly implemented designs for Army facilities for use during peacetime and mobilization in the continental U.S. and major theaters of operation.

Since World War II, the Army had recognized the need for improving their emergency construction planning and support system. Initiated in 1951, the Army Facilities Components System (AFCS) sought to provide a common base for planning, logistics support, and construction of Army facilities in a theater of operations or war zone. The system was composed of a series of planning guides, construction drawings, bills of material, and labor and equipment estimates kept within 12 volumes of technical manuals. These plans provide the necessary construction information for all climatic conditions and lengths of time. The Office of the Chief of Engineers helped develop the system and guided engineering field units with implementation,

then transferred the program to Huntsville Center in 1978 to maintain and modernize the vast amount of information required for the system to be up-to-date. The Center's responsibilities included determining Army and Department of Defense design needs, incorporating advancements in technology, and updating the construction data, as well as distributing the system and arranging for its periodic exercise.[21]

Over the years, AFCS grew to include more than 4,100 facility designs and 750 installation designs, including troop camps, hospitals, bridges, port facilities, petroleum storage and distribution points, and ammunition storage centers. Typically, each year the Center awarded four to six contracts to A-E firms, who prepared new or revised designs. The project priority was worked out jointly between the Assistant Chief of Engineers Office and Huntsville Center, with input from major commands and the Engineer School at Fort Leonard Wood. Recent emphasis had been on streamlining the format of the drawings by establishing standards for austere initial construction. Also, in 1994, the Center significantly expanded the system to cover host nation infrastructure: refugee and displaced civilian relief facilities, schools, dispensaries, wells, roads, bridges, or similar needs. The Center received input from many field units to add or revise the designs. Funding has remained fairly consistent.[22]

As AFCS expanded in size, the Center came to rely on automation to simplify the modernization process. Center engineers used computer aided design and drafting (CADD) to update drawings, while database management programs helped store and manage the many bills of material. Beginning in July 1993, the Center was also responsible for the maintenance and distribution of the Theater Construction Management System (TCMS), a PC-based version of AFCS that included an AFCS database, construction management software, and commercial versions of Microsoft Projects and AutoCAD LT. Center engineers proceeded from 1993-1994 to migrate the system to a Windows operating system, and reconfigure the system to operate with commercial three-dimensional modeling and CADD products. From 1995-1996, the Center

distributed 265 copies of TCMS version 1.2, and a revised version was distributed in 1997. Since all of the AFCS data was available on microfiche, magnetic tape, diskette, and CD-ROM, Huntsville Center decided in 1994 not to distribute hardcopy of most of the information unless requested, thereby reducing design reproduction cost by 40 percent. After that time, TCMS has been the approved source for standard designs, bills of material, construction time estimates, and planning information for facilities constructed by Army engineers.[23]

Another program Huntsville supported was the development and maintenance of Mobilization or "M" Designs. Due to the short lead-time for any mobilization, the Army had used standard designs to allow timely construction of required facilities. The Army had been using Emergency Drawings ("E" Drawings) since the 1950's, but many of these designs were obsolete and did not use modern materials or methods. A mobilization exercise in 1980 indicated a critical need for standard mobilization designs, and in 1981, the Corps assigned Huntsville Center to the program. After determining criteria, the Center awarded contracts for the preparation of 148 facilities: billets, dining halls, administration facilities, etc. However, the Center received no additional funding after 1990, leaving designs for AMC uncompleted. In 1991, Huntsville requested funding for an update study, as many of the specifications were already out of date and many of the designs were misplaced by Corps districts and divisions. In 1994, the Center discontinued the program; however, designs are still available in hardcopy and magnetic tape.[24]

Huntsville Center continued to prepare and update designs and design related documents for major commands in support of forces in the U.S. and in operational theaters, including some very technical designs involving ammunition plants, security equipment, and automated range systems. Many other design programs were less technical but equally demanding, such as the Center's efforts to modernize and standardize construction criteria and designs through the Criteria Document Update Program and the Army Facilities Component System, and develop

operation and maintenance documentation in the Operation and Maintenance Engineering Enhancement program. Although not always exciting, in all cases these programs provided a critical function in maintaining the security, safety, and comfort of American forces worldwide.

XI.

Teaming for Mission Success:

Design – National Missile Defense, Space, and Transportation

Throughout its history, Huntsville Center has provided engineering and design services for several special presidential or Congressional initiatives. The original mission of Huntsville Center was to support a ballistic missile defense system initiated by the Johnson administration – SENTINEL/SAFEGUARD. Though this program had long expired, the Center continued to support the Ballistic Missile Defense Organization (BMDO) and U.S. Army Space and Missile Defense Command (USASMDC) and their high profile missions: the Strategic Defense Initiative, the National Missile Defense and Theater Missile Defense programs, and research of technologies required for construction of radar and missile launch facilities for these programs. The Center also provided highly technical designs for several other key federal agencies, including NASA and the Department of Transportation. As with many of Huntsville's missions, these programs were logistically complicated and concerned sites in many geographic regions.

Ballistic missile defense

The Army's SENTINEL/ SAFEGUARD ballistic missile defense system had been Huntsville Center's founding mission in 1967, and it remained Huntsville's primary responsibility for many years. However, even after Congress discontinued funding the program in 1975, the Center remained USASMDC's single point of contact within the Corps of Engineers in support of the Ballistic Missile Defense System Command, the Ballistic Missile Defense Advanced Technology Center, and the Kwajalein Range Directorate. These responsibilities

included conducting research and providing support for launch facilities and communications systems related to multiple BMD programs. By 1980, the Center's new focus was the Low-Altitude Air Defense System (LOADS), later renamed SENTRY. LOADS/SENTRY included the construction of several test facilities at Kwajalein and White Sands, New Mexico, and required highly technical research into electronic hardness, electromagnetic pulse, nuclear weapon effects, radiation transport calculation, and propellant testing. Huntsville Center provided about half of the work, with the remainder being performed by contractors or supporting agencies.[1]

In 1983, at the same time the SENTRY program was coming to an end, national policy concerning ballistic missile defense was realigned by President Ronald Reagan's announcement that the U.S. would pursue a Strategic Defense Initiative (SDI), which has often been referred to as "Star Wars" because of the futuristic technology required. Rather than simply provide "strategic deterrence" as SENTRY did, SDI attempted the ambitious goal of "strategic defense" against the threat of strategic nuclear missiles using a combination of the latest in radar and missile interceptor technology and developments such as laser-based missile defense. Huntsville Center continued to provide design of testing and deployment facilities for USASMDC in support of the newly created Strategic Defense Initiative Organization. In 1985, the Center became the lead Corps organization for SDI.[2]

The work for USASMDC during this period actually involved several missile defense programs. Some of these were rather short-lived. For example, Huntsville Center supported the Braduskill Interceptor Concept (BIC) Launch Complex, which was halted at the design stage. The Center had completed process designs for the Kinetic Energy Antisatellite Demonstration /Validation Launch Complex, but the project was canceled when it was determined that flight tests were not required to obtain the necessary data. In other projects, such as the STARBIRD Launch Complexes and the Exoatmostpheric Discrimination Experiment Launch Complex,

Huntsville completed the design and transferred construction responsibilities to other military components. The most successful of the missile programs was the High Endoatmospheric Defense Interceptor (HEDI), a two-stage missile that operated high within the atmosphere and just beyond it. The Center helped with design and construction of a launch facility on Meck Island in 1990. Perhaps the highest profile project was the Ground Based Free Electron Laser-Technology Integrated Experiment, an experimental laser weapon that could be used for protection against missile attacks. Huntsville Center helped prepare documentation, develop criteria, complete designs, and provide support for construction of the facilities housing the laser. After the Strategic Defense Command selected the site in 1987, the Center issued contracts and construction began, but funding cuts beginning the following year slowed the work and eventually terminated the project in 1990.[3]

National Missile Defense

By 1992, SDI and the other work for USASMDC had evolved into two separate programs: the National Missile Defense (NMD) program and the Theater Missile Defense (TMD) program. The purpose of NMD was to deploy antiballistic missile installations at various locations to protect the U.S. against a limited ballistic missile attack. On April 2, 1992, the Headquarters of the Corps of Engineers assigned Huntsville Center as the Life Cycle Project Manager for all Corps activities related to NMD in support of USASSDC and the Strategic Defense Initiative Organization (SDIO). Huntsville was responsible for planning, studies, criteria development, design, and construction of both test and deployment facilities assigned to the Army for execution. The first phase of the program involved the test facilities, which would be located at Kwajalein Missile Range. In 1993, Center engineers worked on concept designs for the main components of the program: the Ground Based Radar - Test (GBR-T), the Ground

Based Interceptor (GBI), and the Ground Based Entry Points (GEP). GBR-T, located on Kwajalein, was the major sensor component of NMD. The GBI launch facilities were to be located on Meck Island using an existing Spartan launch cell and a new four-missile launch silo. The GEPs, located on Kwajalein and Roi-Namur, provided a communications interface between GBI and GBR. Huntsville was supporting the construction of several test facilities on Meck Island, such as launch silos, missile assembly buildings, and mission control facilities. In 1993, the Center completed the GBR-T facility design and the GBI and GEP designs to 35 percent, and had actually awarded a construction contract for GBR-T in September, when SDIO (now BMDO) terminated the Center's involvement in early 1994 to reevaluate the program.[4]

As Congress reinitiated research and design of NMD after 1994, however, BMDO requested support for a number of NMD projects. On one project, BMDO invited Huntsville Center to help participate in and prepare a treaty-compliant siting study for the Stanley Mickelson complex in North Dakota to plan for future deployment. The Center contributed several members to an evaluation team representing the Corps, BMDO, the Program Executive Office for Air and Missile Defense, the U.S. Space Command, the Air Force Space Command, and the Army Space Command. After gathering site data and conducting topological surveys, the Center published the voluminous North Dakota NMD Treaty Compliant Siting Survey Report in January 1996, which included initial site layouts for tactical and support facilities. Almost immediately after its publication, BMDO requested Huntsville's support in preparing almost a dozen supplements, including conceptual designs for deployment sites at North Slope, Alaska. These were particularly challenging designs because of the lack of a solid foundation and the extreme temperatures' effect on building materials. The Dakota study and its supplements were completed by October 1997.[5]

In anticipation of orders for deployment, BMDO requested that Huntsville Center continue to help with siting surveys, criteria development, and facility design, including standard

designs for radar facilities, launch facilities, and battalion command facilities, as well as other test facilities. These projects had unique needs: the components had to be designed simultaneously, they had to be prepared for operation by 2003, and they had to be designed without precise environmental and threat analysis because the exact site had not been determined. The design for the radar facility, sited at Department of Defense property at Hampton, North Dakota, included an entire complex: the tower, control room, power plant, fire station, security, lodging, and more. The interceptor facilities included a combined missile assembly and fueling facility, launch silos, and missile storage facilities. The last facility was the combined battalion headquarters, battalion operations, In-Flight Interceptor Communications System (IFICS) facility, and standalone IFICS facilities, which would be located throughout the country to guide the interceptor and provide target updates. The Center completed all of these designs to 35 percent and helped with siting, a difficult task given the tactical requirements. The Center also helped design test facilities, including a launch test facility in the Kwajalein, and IFICS test facilities on Kwajalein and Roi-Namur Islands. The interceptor facility was completed to 35 percent, while the IFICS project on Roi-Namur had actually proceeded to construction. After Huntsville engineers incorporated Value Engineering studies and completed the designs April 28, 1997, the construction contract was awarded on August 12, 1997.[6]

The most successful NMD project of the time period involved design and construction of a tower and other facilities for the Ground Based Radar-Prototype (GBR-P) project on Kwajalein. In October 1995, GBR representatives approached Huntsville Center about a bid to design a radar tower, which they needed in operation by the end of 1997. After tight competition, the Center won the project and started the design in November. By April 1996, Huntsville engineers had performed a siting survey and completed the design. The Corps of Engineers, Honolulu District awarded the construction contract in July, and the contractor broke ground in December 1996. The facility was complete and ready for joint occupation on

September 3, 1997, nearly a month ahead of schedule and $100,000 under budget. In an operation such as this, communication with supporting organizations and contractors was key to success, and in several instances saved large amounts of time and labor. Even as late as December 1996, the Center had to alter the design, but thanks to the Center holding weekly video conferences with Raytheon, the radar system design contractor, Huntsville engineers were able to anticipate many of the changes and deliver the designs in a timely manner.[7]

[Figure 30: The Ground Based Radar-Test]

In November 1996, BMDO requested assistance from Huntsville Center with siting and facility designs for a building to test the Space Based Laser. This high-tech defensive weapon, a large satellite containing a chemical laser that could eliminate ballistic missiles soon after launch, required laser system and environmental tests prior to launch. To test the laser before launch, BMDO required the construction of vacuum facilities that emulated conditions in the outer atmosphere and in space – a chamber to test the laser and a facility to test the satellite's resistance to environmental forces. Since the operational Space Based Laser would be more than 100 feet in length and 28 feet in diameter, the proposed facilities would be the largest vacuum chambers in existence. Huntsville Center would help with site surveys and provide facility designs for the test facilities and related buildings. The Center started working on designs with a proposed construction start date of September 1997 and provided members for a 24-man siting team. After evaluating several government-owned sites in close proximity to a navigable waterway, the team selected four sites for detailed evaluation: Cape Canaveral and Kennedy Space Center, Florida; Stennis Space Center, Mississippi; and Redstone Arsenal, Alabama. The Center completed the facility design to 65 percent in July 1997, and submitted the siting package

to BMDO on March 5, 1998. A decision was expected on the direction of the project sometime in 1999.[8]

[Figure 31: Drawing of the Space Based Laser]

Theater Missile Defense

In addition to NMD, Huntsville Center also supported the Theater Missile Defense (TMD) program beginning in 1994. The purpose of TMD was to protect deployed forces in theaters of operation from ballistic missile attacks. It included the Patriot Advanced Capability-3, which was the next generation of the Patriot missile popularized by the 1990 Gulf War, and the Theater High Altitude Area Defense (THAAD) missiles. At the request of BMDO, Huntsville supported each of these missile programs through site surveys, studies, criteria development, and facility designs for proposed facilities at Fort Wingate Depot Activity, New Mexico; White Sands Missile Range, New Mexico; Key West, Florida; and Kwajalein Atoll and Wake Island in the Pacific. Among the facilities the Center helped design were target launch facilities, missile assembly buildings, and several test facilities.[9]

One of Huntsville's first TMD missions was to design a target launch facility at Fort Wingate. As part of the TMD test program, a missile will be launched from a site near the test kill zone as a target for the THAAD or PAC-3 system. In the case of the White Sands missile range, the target launch pad was located at nearby Fort Wingate. In 1994, BMDO requested the Center's help in designing and supporting construction for a target launch pad and related facilities, including fences, power sources, and sites for radars and other instruments. Engineers at Huntsville started the launch facility design in April 1995, completed the design on July 26, and the Fort Worth District awarded the construction contract in September. Huntsville Center

completed the remaining designs in 1996 and 1997. The Center also supported two other target launch sites. For one site on Wake Island, the Center helped conduct siting studies and prepare design criteria by the end of 1996. The Center would provide similar services for the other site at Key West, Florida, but the initial site survey revalidation was put on hold due to Florida's environmental concerns about the project.[10]

The other TMD projects included a missile assembly facility and several test facilities. The missile assembly facility project originated when BMDO requested that the Center help design a three-bay missile assembly plant in support of the PAC-3 program. After starting the design in February 1995, Center engineers completed it in November, only to have to redesign it due to changing specifications. They completed the design on February 28, 1996, and Fort Worth District awarded the construction contract September 28, 1996. Construction was completed in September 1997. The test facilities on Kwajalein included a radar system maintenance/storage building, missile test facilities, and a radar characterization test facility for the THAAD program. Huntsville engineers started the designs in June 1996, and completed them to 95 percent by the end of 1997.[11]

Advanced Technology

Many of the programs in which Huntsville Center was involved, especially BMD, required research and development of advanced technologies such as system hardening and survivability analysis (both nuclear and conventional) and hardness assessment. This research involved a variety of test projects and specialized studies. In BMD, the purpose of these activities was to develop protection against nuclear and natural effects that could hinder the strategic offense/defense; the National Command, Control, and Communications network; and the survivability of other national assets. Since 1980, the Advanced Technology Branch of

Huntsville Center's Engineering Directorate has provided research and development, feasibility studies, criteria development, design, construction, validation testing, training, and system maintenance for USASSDC, MICOM, NASA, and the Defense Nuclear Agency. These activities focused on three major areas: electromagnetic effects, analysis, and technology transfer.[12]

The Center supported a large number of projects related to research, testing, and standards development for electronics survivability and radiation hardness. It was extremely important in both offensive and defensive missile programs to ensure that sensitive electronics parts and integrated subsystems such as processors, SRAM, AC to DC converters, and non-volatile memories were resistant to disruption by nuclear or conventional weapons. Since the days of SAFEGUARD, when the Center had helped improve radiation hardening on missile silos, the Advanced Technology team has supported electronics effects research by developing and conducting tests and providing criteria for test programs. A major effort involved electronics systems survivability tests for SDI that ensured that avionics technology, such as the microprocessors used in tactical weapons systems, would be safe from electromagnetic pulse, airblast, radiation, ground motion, hypervelocity impact, and heat transfer. Advanced Technology oversaw a contractor's research for the PMA-A1104 and PMA-A1151 test programs involving development and testing of radiation-hardened electronics technologies. After the initial contract expired in 1993, Huntsville Center awarded a five-year contract to Physitron, Inc. on February 12, 1993 to complete the research. In 1997, the program had proceeded to testing the capabilities of commercial off-the-shelf parts. From 1993-1994, the Center supported tests at various government laboratories that gauged the degree of protection from the electromagnetic pulse created by a nuclear explosion and validated that hardware was hardened to appropriate radiation levels. In 1995, the Center coordinated a two-year test with Sandia National Labs to demonstrate that electronics can operate without upset through NMD-type threat environments.

The first two phases of this No Upset Processor program, which concentrated on design, were extremely successful. Phase III, which started in 1997, would concentrate on processor fabrication and demonstration.[13]

The analysis activities included a number of studies performed by Advanced Technology experts in a variety of areas. Most of these studies involved complicated analysis using 3D models and computation. For example, Center engineers conducted in-house studies of hypervelocity impact and continuum mechanics analyses for NASA and USASSDC, including helping the NASA Debris Working Group determine the effect of meteoroid impact on designs of the space station, then suggesting ways of optimizing the designs. One study for DNA demonstrated a containment facility for a hypervelocity rail gun. Huntsville engineers also helped conduct studies to optimize warhead lethality. They supported the MICOM Hellfire demonstration, made several suggestions to improve the designs, provided pretest analyses to support experiments, and helped improve research by resolving discrepancies between test goals and the mechanics of the experiments. On numerous occasions, the Center provided NASA, BMDO, DNA, and other organizations with specialized calculations for various programs.[14]

Because of Advanced Technologies' expertise in testing technologies, they provided support to a number of programs and agencies in researching and transferring applicable technologies. In the BMD programs, this involved providing data about processors or other technologies that could operate under very high radiation levels. Using sensitive equipment, engineers were able to pinpoint weaknesses internal to the processor and suggest possible physical contributors to processor failure. For a short time, Advanced Technology maintained a database, the Survivability Technical Information Center, which contained data about a number of survivability technologies; however, because of funding cuts, the database was transferred to the Missile Defense Data Center. Advanced Technology also performed a number of studies for Ordnance and Explosives Applied Technology and the MAGLEV transportation system and

helped these programs develop and implement important advancements related to both computers such as geographic information systems and other technologies such as magnetic sensors used in mine sweeps (see chapter six).[15]

NASA support

In addition to BMDO and USASSDC, Huntsville Center supported several other national initiatives and organizations. One agency that the Center had supported for a number of years was the National Aeronautics and Space Agency (NASA). The Center had been supporting NASA since 1971, when NASA signed a memorandum of agreement with the Center in which Huntsville would serve as the single point of contact in supporting construction of test facilities for the Apollo and Space Shuttle programs. Most recently, under a memorandum of agreement with NASA dated April 21, 1989, the Center agreed to support the design and construction of facilities to manufacture an advanced solid rocket motor (ASRM), an essential vehicle for launching space station components. There were several years of progress at the multiple construction sites located at Yellow Creek (Iuka), Mississippi, and other supporting sites, and NASA authorities had expressed their satisfaction with Corps of Engineers efforts. The ASRM designs were completed to 98 percent and construction proceeded to 50 percent. Following severe cost overruns, however, Congress directed NASA to issue a letter of termination, sent out October 19, 1993. By January 1994, the contract had been closed out, and no follow-on work was expected.[16]

MAGLEV

Perhaps the most unusual high-profile project Huntsville Center supported was the MAGLEV program, a transportation system in which "magnetically levitated" vehicles are able to harness magnetic force to move along a guideway at speeds up to 300 miles per hour. The concept of a MAGLEV was originally developed in the U.S. in the 1960s and 1970s, but since Congress terminated research in 1975, Germany and Japan have built MAGLEV prototype trains that are fast, clean, and energy-efficient. Because of the success of these systems, Senator Patrick Moynihan of New York, the chairman of the Senate Transportation Committee, sought to reinitiate MAGLEV research in the U.S. in 1989 to meet future transportation needs currently being served by short-haul air travel. Since several agencies were researching a MAGLEV, the Office of Management and Budget recommended the creation of a National MAGLEV Initiative (NMI) involving the Corps of Engineers, the Department of Transportation, and the Department of Energy, and supported by the Department of Commerce, the Environmental Protection Agency, the Public Heath Service, NASA, and several Defense agencies. The primary purpose of the NMI was to determine the feasibility of producing an advanced U.S. MAGLEV system. Then in December 1992, President George Bush signed the Intermodel Surface Transportation Efficiency Act (ISTEA), which established, among other things, a National Magnetic Levitation Prototype Development Program mandating the design, construction, and testing of a MAGLEV within seven years. The program would proceed in three phases: planning; gathering data, conducting studies, and developing a design; and prototype implementation.[17]

In 1993, the Bush Administration decided not to request funding for the prototype program until completion of the NMI analysis. Released in November 1993, the NMI report supported the development of a prototype system within the framework of ISTEA. In April 1993, Department of Transportation Secretary Pena initiated a five-year High Speed Ground Transportation Initiative and requested funds for additional MAGLEV research; however, no funding was provided in 1994. As a result, in December 1993, Huntsville civic and business

leaders, including representatives from the Huntsville Center MAGLEV team, met with Alabama Governor Jim Folsom, Jr. about building a 20-mile test facility from Huntsville to Decatur, Alabama, or including a future MAGLEV system in the right-of-way planning for a Memphis to Atlanta highway. After researching the possibilities, the State Department of Transportation decided not to pursue MAGLEV.

The Center continued to provide MAGLEV support for the Federal Railroad Administration through 1994, including program management, technical support, cost analyses, vehicle-guideway interaction modeling, and research into magnetic effects on steel reinforcement. The Transportation Equity Act for the 21st Century (PL 105-178), which was signed into law in 1998, included the MAGLEV Deployment Program to design and construct a system somewhere in the U.S. in a public/private partnership. The U.S. Department of Transportation will manage this new program, though the Corps continued discussing a potential role in supporting the program.[18]

After thirty years, the Center continued to demonstrate the technical expertise required by some of the nation's most complicated defense programs, as well as other highly technical national initiatives that drew public attention. In every case, the Center was successful in providing its customers with design or design review services. In many cases, it demonstrated the capability to fully compete with the leading private design companies and provide services faster and for lower cost. Unlike many commercial endeavors, the Center worked with the government community as a team – "a team of systems developers, a team of military users, and a team of architects and engineers to provide the nation with the best facilities," as one NMD program manager put it. Although ASRM is no longer active, and the future of NMD and MAGLEV are still undetermined, the Center has proved that after all these decades, it still has the expertise, the cost-effectiveness, and the team spirit to continue supporting the nation's most important programs.[19]

XII.

Quality of the Highest Order

After 30 years of innovation and customer service, Huntsville Center was recognized, not only as one of the best organizations in the Army, but one of the best in the federal government. The many quality initiatives in which Huntsville Center had invested their future over the years had paid off in a big way. From the first attempts at Total Quality Management in late 1993 to the adoption of the Malcolm Baldrige award criteria in 1995, the Center had strived for and achieved a quality not to be matched by many government organizations, as demonstrated by the many complex programs it supported. Through these programs, the Center brought innovative and cost-effective management resulting in significant savings for the Army and the nation.

In late April 1998, Huntsville Center once again was selected as runner-up in the Army Communities of Excellence (ACOE) contest for its 1997 submittal. It was the fifth time the Center had won recognition for ACOE since the late 1980s. After its 1995 submittal, when ACOE first began to be based on the Army Performance Improvement Criteria (APIC), the Center had been recognized every year – quite an accomplishment given the high standards of quality improvement APIC required. In addition, in 1997 the ACOE submission earned the Center the Chief of Staff Award, a special citation within the ACOE contest given to particularly outstanding organizations. It was only one of nine active Army units to receive the Chief of Staff Award that year.[1]

Following that honor, on June 17, 1998, Huntsville Center received the President's Quality Award (PQA) Achievement Award for sound business practices across the organization.

The highest recognition for quality in the federal government, PQA recognizes federal organizations that have improved overall performance and demonstrated high quality products and services. The PQA Achievement Award, which Huntsville Center won by improving customer service and saving tax dollars, is the third level of recognition out of a possible four. Though it was Huntsville Center's first year competing, it was the highest level of achievement in this or any other Baldrige-based award received by any engineering or construction organization in the private or public sector.[2]

On June 17th, representatives from all PQA award winners met at the International Trade Center at the Ronald Reagan Building in Washington, D.C. To much applause, Janice R. Lachance, the director of the U.S. Office of Personnel Management, presented the awards to the 11 commanders who led the model federal organizations being honored. Afterwards, guest speaker David O. Cooke, director of Administration and Management for the Secretary of Defense, presented his remarks. Noting that downsizing the federal government did not come without costs, Cooke reminded the audience that many organizations were faced with the dilemma of producing outstanding services with fewer resources. This was, he said, the very criteria on which the President's Quality Award is based. In his acceptance speech, Huntsville Center Commander Col. Walter Cunningham agreed. "With lower budgets and less people available to help, we had to become resourceful."[3]

[Figure 32: President's Quality Award presentation]

Huntsville Center had clearly demonstrated its capacity to improve service in the face of shrinking budgets, and had in fact increased its workload, which always involved the most complex of engineering tasks. Two such tasks were the Department of Defense's largest public safety programs: Ordnance and Explosives (OE) and Chemical Demilitarization. As a

subdivision of the Defense Environmental Restoration Program, OE removal was a requirement at hundreds of installations or formerly used defense sites across the U.S., requiring a significant amount of the funding earmarked for environmental restoration. The Center had to track dozens of sites at any given time, manage contracts, provide guidance, and coordinate public safety and involvement. And while explosives experts at the Center prove year after year their ability to react quickly to dangerous OE finds and remove them in a safe and thorough manner, it appeared at the end of 1997 that OE work would follow for many years to come.

The largest program Huntsville Center has ever supported was the design and construction of chemical weapon disposal facilities – the largest construction program in the Department of Defense. Each incineration facility cost more than $200 million and would take three years to build. Like many of Huntsville Center's missions, the demilitarization plants required a wide range of technical knowledge. Construction standards were extremely exacting to ensure the proper blast resistance and safety from any chemical leaks. The facilities had to comply with strict environmental regulations while being capable of destroying chemical weapons in a closely monitored, automated environment using complicated equipment. Because of the danger, the disposal program required a very tight schedule, and at the end of 1997, plants on Johnston Island and at Tooele, Utah, were fully operational; facilities at Anniston, Alabama, and Umatilla, Oregon, were in the midst of being built; and a construction contract for another facility at Pine Bluff, Arkansas, was awarded. To meet these challenges, the Center had once again taken responsibility for a major construction effort involving major facilities at multiple sites. As its funding and obligations grew, so did its dedicated manpower until more than half of the Center's resources were focused on the program.

In many ways, chemical demilitarization hearkened back to the early days of Huntsville Center, when the majority of its employees were dedicated to the design and management of the construction of dozens of ballistic missile defense (BMD) facilities nationwide. Chemical

demilitarization also was national in scope, large in scale, and required technical expertise. The primary difference was that in the days of BMD the military was expanding, as was the Center itself. In 1997, the military faced serious challenges as it tried to maintain its capabilities with diminishing resources. The Center could no longer afford the luxury of working on a single program: each employee had to do more with less, and this required significant streamlining. It is a testimony to Huntsville Center's efficiency that while the Center had more or less doubled its workload from 1993-1997, the number of employees stayed approximately the same.[4]

The PQA judges who evaluated the Center's submission were no doubt aware of the "resourcefulness" Colonel Cunningham described. Without any direct Congressional appropriations, the Center operates like any commercial endeavor – through reimbursable work it performs as it competes for customers within the U.S. government against other organizations and businesses. In this environment, its survival depends on customer satisfaction. Through a constant evaluation of its business processes and an innovative spirit, the Center reduced its overhead rates from 45 percent in 1995 to 28 percent in 1997. It offered unique services and products, such as contracting procedures that saved medical installations thousands of hours and dollars on repair work, or the Energy Savings Performance Contracting program that allowed installations to upgrade energy systems without paying a cent only by sharing the energy savings. And while contractors were increasingly doing more of the military's work, the Center's BMD program competed against a *Fortune* 500 company for a design contract and was chosen because of its long track record of completing complex tasks under tight deadlines.[5]

This is not to say that there were not problems and difficulties along the way. As a government agency, the Center was inhibited by many regulations guiding other government agencies, and the fortunes of its programs were often left to a dynamically changing body politic caught up in political battles. Countless programs, many of them successful, ended prematurely because Congress decided not to provide further funding, wasting both the Center's and the

nation's resources. Other programs were caught in a quagmire of regulations and red tape that prevented progress or program completion. Some of the Center's most successful programs were merely resolutions of long-standing problems with excessive bureaucracy. In some cases, most notably chemical demilitarization and ordnance removal, a concerned public posed severe obstacles to program success. Eager to deal with imminent dangers, many citizens wanted instant relief with 100 percent guarantees. Yet when faced with the cost and the potential risks of a solution, they questioned the wisdom of the Army's chosen paths. The effects of the government's past mistakes and secretive behavior on our citizens are only recently being mitigated by a new season of openness and greater public engagement. Nevertheless, when examining these problems, it only makes Huntsville Center's accomplishments that much more remarkable.

With the PQA award, the nation saluted Huntsville Center, and though proud of the recognition, Center management did not rest on its laurels, choosing instead to continue to pursue the quality that had made it the service-provider of choice within the Department of Defense. "To improve," David Cooke said at the PQA presentation. "That's all we ask of those who serve in the military, and that's exactly what these awards represent, outstanding improvement." And that is also exactly what the awards encourage. The real benefit of the PQA program, according to Huntsville Center Quality Coordinator Donna Rovere, is "the process of getting an external view of our business strengths and weaknesses. . . . and then use what we learn to help us improve our business processes." This endless drive for improvement is the true definition of quality and the real lesson of the Huntsville Center's history.[6]

Appendix A

Commander Biographies

Colonel Robert D. Brown III, 1992-1995

Colonel Robert "Duncan" Brown assumed command of the Huntsville Division, U.S. Army Corps of Engineers on July 28, 1992.

A native of Virginia, Colonel Brown earned a MSCE degree from the University of Illinois, an M.B.A. from Monmouth College, and is a registered Professional Engineer in Virginia . He is a 1965 graduate of the U.S. Military Academy, West Point. After graduation, he received his commission in the Infantry and later transferred to the Corps of Engineers.

He served with the 82nd Airborne Division at Fort Bragg, N.C., and in the Dominican Republic. He also served with the 4th Engineer Battalion in Vietnam and has worked as a staff officer in the Readiness Region at Fort Dix, N.J.; Eighth Army Headquarters in Korea; the Waterways Experiment Station at Vicksburg, Ms.; and the Office of the Chief of Engineers in Washington, D.C. Colonel Brown commanded the 588th Engineer Battalion, Fort Polk, La. and the Portland Recruiting Battalion, Portland, Or. He was the Deputy Brigade Commander, 130th Engineer Brigade, Hanau, Germany and the Commander of the Huntington District. Colonel Brown served as the DEH at Fort Bragg, N.C., from 1988-1990. He most recently was the Engineer for U.S. Forces, Korea and Eighth Army.

A graduate of the U.S. Army War College and the Command and General Staff College, Colonel Brown is Airborne, Ranger, and Pathfinder qualified. His military decorations include

the Legion of Merit (3 awards), Bronze Star (“V” Device and Oak Leaf Cluster), Meritorious Service Medal (4 awards), and the Army Commendation Medal.

Colonel Walter J. Cunningham, 1995 to present

Colonel Walter J. Cunningham holds a Bachelor of Science Degree in Civil Engineering from Mississippi State University and a Master's degree of Science in Civil Engineering from the University of Illinois. He is a graduate of the Army Command and General Staff College and the Army War College. He holds the title of Professional Engineer, registered in Alaska. He is married to the former Phyllis Hope Crum of Corinth, Mississippi.

He served as program manager at the Construction Engineering Research Laboratory, Champaign, Illinois, and the initial project engineer for the construction of Ramon Air Base, Israel. In addition, he was Military Assistant to the Honorable Robert W. Page, former Assistant Secretary of the Army for Civil Works. Other assignments include member of the staff and faculty of the U.S. Army War College, Carlisle, Pennsylvania, platoon leader and Company Commander in the 808th Engineer Battalion and as Commander of the 47th Engineer Company at Fort Wainwright, Alaska. While assigned at Fort Wainwright, Cunningham also served as the Operations Officer for the Facility Engineer. He was the Battalion Operations Officer of the 588th Engineer Battalion, Fort Polk, Louisiana, served as the Chief of the Combat Support Division Readiness Group in Denver, Colorado, and commanded the 52nd Engineer Battalion at Fort Carson, Colorado.

Following a tour as Commander and District Engineer for the U.S. Army Corps of Engineers, Seattle District, Cunningham became Deputy Commander of U.S. Army Corps of Engineers, Huntsville Division on April 4, 1994 with oversight of the Chemical Demilitarization program. He assumed command of Huntsville Division on June 8, 1995.

Appendix B

Personnel and Strength Reports

Total Personnel

	Permanent	Part Time/ Permanent Intern	Temporary	Co-op	Total
1993	587	8	31	4	630
1994	595	8	38	2	643
1995	590	7	18	2	617
1996	595	7	28	2	632
1997	560	7	18	5	590

Personnel by Office

	1993	1994	1995	1996	1997
Executive Office	10	9	7	7	8
Management Review	17	17	15	14	13
Office of Counsel	4	5	5	4	5
Public Affairs	4	5	3	3	4
Audit Office	3	3	3	3	3
Security and Law	2	2	2	2	2

Logistics Management	10	12	12	11	11
Information Management	40	40	39	35	27
Contracting	50	52	48	50	47
Resource Management	53	50	46	41	34
Engineering Directorate	223	202	201	205	211
Program Management	70	98	46	47	45
Chem Demil	32	42	20	18	18
Training/ PDSC	55	57	59	57	52
Human Resources/ CPAC	14	15	12	9	3
Chem Demil Construction	--	--	18	23	49
Ordnance and Explosives	--	--	45	50	53
Other (Interns, USACE RM/AO, etc.)	43	34	38	53	5

Appendix C

Organizational Descriptions

Commander – Directs, manages, and controls all activities of Huntsville Center and exercises unlimited contract award approval authority.

Deputy Commander – Provides managerial overview and supervision of the Directorate of Resource Management, Directorate of Information Management, Directorate of Logistics, the Office of Counsel, Office of Security and Law, and the Management Review Office, Audit Office, Public Affairs Office, and Safety and Occupational Health Office. Acts in the capacity of the Commander in his absence.

Deputy Commander, Programs and Technical Management – Provides managerial overview and supervision of the Directorate of Chemical Demilitarization Program Management, Directorate of Programs and Project Management, Directorate of Engineering, Directorate of Chemical Demilitarization Construction, Directorate of Contracting, and Ordnance and Explosives Team.

Executive Assistant – Assists the Commander in managing, directing, and supervising Center mission activities. Serves as advisor to the Commander and his staff and coordinates the functions of the Executive Office with the support staff.

Value Engineering Officer – Exercises overall staff management of the Center VE Program, and, as a special assistant to the Commander, is directly responsible to the Commander for maintaining it as a viable, permanent, and integral part of Center activities.

Assistant Director of Small Business – Serves as the special assistant to the Commander for the Small and Disadvantaged Business Utilization Program. Develops program goals, and evaluates performance to ensure goals are achieved.

Equal Employment Opportunity Officer – As a special assistant to the Commander, coordinates, monitors, or advises the EEO and Affirmative Action Programs for the Commander.

Quality Management Specialist – Assists the Commander in the implementation of quality concepts, objectives, and philosophy throughout the entire Center.

Directorate of Information Management – Develops policies, plans and procedures, and ensures the execution of information mission areas responsibilities. Information mission area encompasses communications (voice and data), automation (including office automation), audio-visual information, libraries, records management, publications, and printing.

Safety and Occupations Health Office – Manages the Center Safety and Occupational Health Program designed to reduce and minimize the accidental manpower and monetary losses and to provide a safe and healthful environment for those exposed to Center operations.

Public Affairs Office – Provides for planning, developing, and managing public information, command information, and community relations matters for the Center.

Directorate of Logistics Management – Provides logistics support to the activities within and attached to the Center. The Director of Logistics is responsible for supply management, accountable property management, stock control procedures, central issue facility for office supplies, Center's command supply discipline program, processing reports of survey, inventory management, disposition of excess property, asset reporting programs, storage facilities, use of hazardous materials in logistics applications, transportation and movement, Center's personal property maintenance management program, repair and/or disposal of unserviceable or excess items, Army warranty program, calibration of equipment, industrial property management, space

management, and the supervision, planning, programming, budgeting, and administration of logistics functions.

Directorate of Resource Management – Assists the Commander and members of his staff in the maintenance of balance, economy, and efficiency in the accomplishment of the Huntsville Center mission.

Office of Counsel – Serves as counsel and renders legal advice and assistance to the Commander, Deputy commander, Contracting Officers, and their staffs.

Directorate of Engineering – Serves as the element responsible for engineering management, planning, facilities and equipment design, and other special tasks on a variety of assigned missions. Accomplishes all facets of engineering from program inception to completion, encompassing such fields as safety engineering, research and development, and across-the-board coverage in the disciplines of civil, architectural, structural, mechanical, and electrical engineering. Provides engineering services for planning; programming; cost estimating; operations research; research and development studies; tests and analysis; facilities and equipment; criteria development, formulation, and support; advanced design studies, services, and investigations; design analysis, operations, and product planning; contract formulation, negotiations, and technical management of engineering contracts; coordination of real estate, family housing, utility services, access roads, and site selection matters; design and preparation of construction and procurement drawings and specifications; environmental controls including preparation of environmental assessments and environmental impact statements; system logistics analyses and implementation; standardization; and configuration management. Provides engineering design assistance to other major subordinate commands during construction and operation. Provides consultation and advice to the Deputy Commander for Programs and Technical Management and his staff on all aspects related to Engineering responsibilities.

Directorate of Contracting – Plans, directs, and accomplishes negotiations, executions/ administrations of supply and service-type contracts, including contracting officer responsibilities for a variety of programs as assigned by HQUSACE or requested by other Federal agencies. Provides acquisition expertise for special projects/programs as directed by HQUSACE. Performs contract services for construction-type contracts and maintains all official contract files for the Center for all types of contracts. Reviews proposed A-E acquisition package submitted to the board of awards and participates in board meetings. Performs contracting reviews and compliance and oversight for A-E contracts.

Office of Security and Law Enforcement – Functions as the Security and Law Enforcement Manager and exercises staff supervision over security and law enforcement. Serves as staff advisor to the Commander and technical consultant to command and staff elements regarding effective application of security practices and procedures. Maintains liaison with military and civilian local, county, state, and national law enforcement agencies.

Directorate of Chemical Demilitarization Program Management – Serves as the single point of contact for all Corps of Engineers activities of the Chem Demil Program. Develops and maintains project management plans, project scopes, budgets, schedules, procurement strategies, project management data, memoranda of understanding, standing operating procedures, support agreements, and related documents. Manages and coordinates projects from inception to completion to ensure execution within allocated resources and with the desired quality and timeliness. Plans, directs, and accomplishes negotiation, execution, and management of contract and acquisition activities. Develops project schedules, cost estimates, obligation and expenditure schedules, and obtains technical and support staff commitment. Provides reports, project status, information and recommendation/advice to the contracting officer. Assists in the development of and is responsible for data maintenance and operational aspects of a management information system for Chem Demil. Ensures effective usage of automated cost/schedule control and

reporting systems to provide required reports, at all management levels of the life cycle project management process.

Audit Office – Serves as staff advisor to the Commander and members of his staff by performing audits and internal reviews, troubleshooting special problem areas where the Commander requires an independent assessment, and providing liaison, monitoring, and audit follow-up services on Huntsville Center audits by external agencies.

Management Review Office – Serves as the responsible organization for contingency planning of assigned projects and programs. Establishes guidance, requirements, direction, and priorities for actions by military and/or civilian forces in the areas of readiness, logistics and intelligence support, property and materials management, engineering, and military operations in order to respond to emergencies, natural disasters, and/or military crises. Plans, directs, executes, and manages contracts as required by the assigned missions. Establishes policy and provides criteria for planning, design analysis, construction, and operations including structural, control, mechanical, and electrical systems associated with large industrial plants and facilities. Manages security in accordance with applicable regulations and provides a dedicated program manager to the HQUSACE program manager. Serves as the HQUSACE executor and Center focal point for all aspects of assigned projects or programs. Coordinates plans with other military agencies to assure operational readiness and performs required training. Ensures the preparation of necessary agreements for required support from other military organizations.

Directorate of Programs and Project Management – Serves as the element responsible for planning, programming, managing, coordinating, directing, controlling, and executing a variety of assigned missions. Develops and oversees the implementation of project management policy and accomplishment of the program and project objectives in the Center.

Directorate of Chemical Demilitarization Construction – Serves as the element responsible for management of the construction program, the quality, cost, and timeliness of the facilities

constructed in the Chemical Stockpile Demilitarization Program until formally accepted for systemization by the contracting officer. Serves as a consultant to the Project management for Chem Demil staff, Center commander, and director of Chem Demil and other officials on construction issues, policies, and management processes. Coordinates and manages the field offices executing and managing construction. Develops and maintains project management plans, construction scopes, budges, schedules, management data, standing operation procedures, support agreements, and related documents. Develops construction schedules cost estimates, obligation and expenditure schedules, budges, manages the S&A accounts, and obtains technical recommendations/advice to involved parties.

Ordnance and Explosives Team – Serves as a self-managed work team responsible for planning, programming, managing, coordinating, directing, controlling, and executing the OE program. Implements Center project management policy and objectives provided by Center project management.

Notes for Chapter 1

1. James H. Kitchens, III, A History of the Huntsville Division, U.S. Army Corps of Engineers, 1967-1976. (Huntsville, AL: U.S. Army Engineer Division, 1978), p. 2-3. See also Louise Schwallie Heidish, A History of the Huntsville Division, U.S. Army Corps of Engineers, 1977-1981 Update (Huntsville, AL: U.S. Army Engineer Division, [1983]); Louis Torres, A History of the Huntsville Division, U.S. Army Corps of Engineers, 1982-1987 Update (Huntsville, AL: U.S. Army Engineer Division, 1988); and Damon Manders, ed., A History of the Huntsville Division, U.S. Army Corps of Engineers, 1988-1992 Update (Huntsville, AL: U.S. Army Engineer Division, 1996).

2. Kitchens, pp. vii-xii; Personal Communication, Ron Lein to Damon Manders, Huntsville, AL: Nov. 30, 1998.

3. Ibid., pp. 1-5, 41.

4. Ibid., pp. 9-21, 31-42.

5. Ibid., pp. 22, 102, 103, 114, 117, 124, 126-151, 157, 161.

6. Heidish, pp. 1, 9-14, 20, 22-23, 30-36, 38, 41-5; quote on p. 1.

7. Ibid., pp. 4-8, Torres, 2.4-2.8.

8. Torres, pp. 1.2-5; letter from Col. John A. Poteat to Lt. Gen. Joseph K. Bratton (16 July 1984, Periodic Letters, HND) quoted on p. 1.2-1.3.

9. Torres, pp. 3.1-3.6, 3.10, 4.1-4.4, 4.9-4.12, 4.17, 6.1.

10. Manders, pp. 1-6, 53-58.

11. Ibid., pp. 12-17, 19-33, 36-40, 42-43.

12. "Huntsville Division has been renamed," Huntsville Bulletin, Oct./Nov. 1995, p. 1 (hereafter cited as Bulletin); Col. Walter Cunningham, "Commander's Column", Bulletin, Oct./Nov. 1995, p. 2; Col. Robert D. Brown quoted in Brown, "Commanders Column," Bulletin, Feb. 1995, p. 2; Cunningham, "Commanders Column," Bulletin, Aug./Sept. 1995, p. 2; "Army develops performance improvement criteria," Bulletin, Sept./Oct. 1995, pp. 1, 3; "Visions Developed for Product Lines," Bulletin, May/June 1996, p. 7.

13. Interview with Col. Walter Cunningham, Mar. 18, 1998; Cunningham, "Viewpoint," Bulletin, Oct. 1997, p. 2.

Notes for Chapter 2

1. Although the change in name did not take place until 1995, from this point on, the organization will be referred to as the Huntsville Center to avoid using multiple titles for the same organization within a short space.

2. Kitchens, p. 172; Judy Wilson, ed., Annual History, 1993, Huntsville Division U.S. Army Corps of Engineers (Huntsville, AL: CEHND-PAO, n.d.), p. 55; Mike Paludan, "New Army Corps building approved," Huntsville Times, Sept. 17, 1993, p. A16; Interview with Bob Joslin, Huntsville, AL: June 24, 1998.

3. Manders, pp. 6-7; Interview with Bob Joslin; Bob Howard, "MOVE Coordinator announces how we'll get from here to there," Bulletin, Mar. 1994, p. 3; Bulletin, Jan. 1993, p. 1; Bob Joslin, "HND site announcement delayed," Bulletin, Feb. 1993, p. 1-2; Howard, "Huntsville Division new office site awarded ... construction to begin soon," Bulletin, Sept. 1993, p. 1; Standard Form 81, Request for Space, 5 Mar. 1992 (Installation Historical Files, Huntsville Division Move to New Building, 1993); "DUMP (Division Urgent Moving Project) committee meets GSA," The Move, CEHND-PAO, n.d.

4. Bob Howard, "Groundbreaking makes HND move official," Bulletin, Nov. 1993, p. 1; Howard, "MOVE Coordinator announces how we'll get from here to there," Bulletin, Mar. 1994, p. 3; Howard, "Occupancy of new building closer," Bulletin, Aug. 1994, p. 1; "Move countdown is on," Bulletin, Sept. 1994, pp. 1-2; Brown, "Commander's Column," Bulletin, Sept. 1994, p. 2; Col. Brown quoted in Brown, "Commander's Column," Bulletin, Dec. 1994, p. 2; Maj. Robert Talianko to Wendy Sanderson, May 6, 1994 (ED files, Box 4-1994, file 210-20b); Maj. Robert Talianko to Wendy Sanderson, June 9, 1994; Maj. Robert Talianko to Wendy Sanderson, Nov. 2, 1994; Maj. Robert Talianko to Wendy Sanderson, Jan. 19, 1995; Wilson, ed., Annual History, p. 41; Interview with Ron Sketo, Huntsville, AL: June 9, 1998.

5. Brown, "Commander's Column," Bulletin, Sept. 1994, p. 2; Wilson, Annual Report, 1993, p. 56; Draft After Action Report on Move, [1995]; Interview with Sketo, June 9, 1998.

6. "Ribbon Cutting and Open House, March 28," Bulletin, Feb. 1995, pp. 1, 3; Maj. Robert Talianko to Wendy Sanderson, Jan. 9, 1995; Maj. Robert Talianko to Wendy Sanderson, Nov. 2, 1994; Maj. Robert Talianko to Wendy Sanderson, Jan. 19, 1995; "March 28 – a day to remember at CEHND," Bulletin, Mar./Apr. 1995, pp. 1, 3; Sue Baber, "Tornado drill proves 540 people don't go into 1 hall," Bulletin, Mar./Apr. 1995, p. 9; Interview with Ron Sketo.

7. Howard, "Col. Duncan Brown announces retirement," Bulletin, Mar./Apr. 1995, p. 2; "Cunningham will become Huntsville Division Deputy Commander," Bulletin, Mar. 1994, p. 2; "New Commander at Huntsville Division," Bulletin, May/June 1995, p. 1.

8. "Chief of Engineers offers command advice to colonel," Bulletin, June 1995, pp. 1, 3, quote on p. 3; Interview with Cunningham.

9. HND Directory Charts and Position Charts, 1993-1997; Army Performance Improvement Criteria, Huntsville Division, 1995 (Huntsville, AL: U.S. Army Engineer Division, [1995]), p. i; Total Quality ... Army Performance Improvement Criteria 1996, Engineering and Support Center (Huntsville, AL: U.S. Army Engineer Division, [1996]), p. i; Army Performance Improvement Criteria, 1997 (Huntsville, AL: U.S. Army Engineer Division), 1997, p. i; Howard, "Emmett Creekmore retires after 42 years in Civil Service," Bulletin, July 1993, p. 10; Howard, "New Director of Training assumes duties in March," Bulletin, Feb. 1994, p. 3; Personal

Communication, Robert DiMichele to Damon Manders, Huntsville, AL: Sept. 3, 1998; Personal Communication, John Samuelson to Damon Manders, Huntsville, AL: Aug. 31, 1998.

10. Linda D. Kozoryn, "Defense reform calls for cuts, privatizing, contracting services," Bulletin, Nov. 1997, p. 2; Jim Garamone, "Commission recommends more reliance on private sector," Bulletin, July 1995, p. 5; Garamone, "Commission report recommends management changes, restructuring," Bulletin, July 1995, pp. 5-6; Howard, "Chief answers downsizing questions," Bulletin, Mar./Apr. 1995, p. 4; "Congressional Plan to Cut Number of Divisions," Bulletin, June 1995, p. 4; "Proposal for Corps of Engineers District Restructuring Announced," Bulletin, Aug./Sept. 1995, pp. 1,4; "Possible Conversion of Huntsville Division" Bulletin, Aug./Sept. 1995, p. 4; Brown, "Commander's Column," Bulletin, Feb. 1993, p. 2; Howard, "New employees fill positions at HND," Bulletin, Aug. 1993, p. 6; Memo to USACE, RE: District Restructuring, 23 Aug. 1995 (Installation Historical Files, Restructuring – U.S. Army Corps of Engineers, 1995). The new Corps plan announced in Feb. 1996 included provisions, among others, to close the Pacific Ocean and N. Central Divisions and move their subordinate commands to neighboring districts; "Corps Proposes Division Restructuring Process," Bulletin, Feb. 1996, pp. 4, 8.

11. Memo from Zirschky quoted in "Possible Conversion of Huntsville Division" Bulletin, Aug./Sept. 1995, p. 4; "Huntsville Division has been renamed," Bulletin, Oct./Nov. 1995, p. 1; Cunningham, "Commander's Column," Bulletin, Oct./Nov. 1995, p. 2; Letter from Gen. Arthur Williams to Sen. John Chafee, copy distributed Nov. 8, 1995 (Installation Historical Files, Restructuring – U.S. Army Corps of Engineers, 1995).

12. Anne Camden, "Huntsville Division reorganizes some Directorates," Bulletin, Apr. 1994, p. 6; Huntsville Division Annual Report, 1994 (Huntsville, AL: CEHNC-PAO, 1995), pp. 5, 7; APIC 1995, p. 66.

13. APIC 1995, p. i; Personal Communication from Elizabeth Neff to Damon Manders, Huntsville, AL: Aug. 3, 1998.

14. "Personnel support to come from Redstone," Bulletin, Nov./Dec. 1996, pp. 1, 5; APIC 1997.

15. Heidish, pp. 41-46; Torres, p. 6.2; Manders, ed., p. 47-49; Howard, "Emmett Creekmore retires after 42 years in Civil Service," Bulletin, July 1993, p. 10.

16. Wilson, Annual History, 1993, p. 42; APIC 1995, p. 39; Command Briefings, FY 1995-1996; "CE Training Directorate transfers Headquarters," Bulletin, Sept./Oct. 1996, p. 8; Personal Communication, Gary Andrew to Damon Manders, Huntsville, AL: July 6, 1998.

17. Woler J Seward, "TQM Corner," Bulletin, Sept./Oct. 1996, p. 5; Betty Neff, "DoD visit to Huntsville Center," Bulletin, Aug. 1996, p. 6.

18. "Ballard's town hall meeting provides insight to Chief's Strategic Vision," Bulletin, Nov. 1997, p. 1, 8; Interview with Cunningham; Diane Helser, "Quality Corner," Bulletin, Nov. 1997, p. 8; Memo for Division Commanders, Primary Staff, and SESs, Subject: Commander's Trip Report for Huntsville Engineering Center, Oct. 29, 1996 (Installation Historical Files, Visit by COE Commanding General, LTG Joe N. Ballard, 29 Oct. 1996: 1996).

19. Henry Everitt, "Open Letter to HND employees from Henry Everitt," Bulletin, Jan. 1994, p. 2.

Notes to Chapter 3

1. Betty Neff, "DoD visit to Huntsville Center," Bulletin, Aug. 1996, p. 6; Kozaryn, "Defense reform calls for cuts, privatizing, contracting services," Bulletin, Nov. 1997, p. 2; Douglas J. Gillbert, "Civilian Cuts Challenge Work Force Quality," Bulletin, Aug. 1996, p. 8.

2. Manders, pp. 53-56; "ACOE Award monies divided on HND projects," Bulletin, May 1993, p. 7; "Employee donates painting to HND," Bulletin, May 1993, p. 7; Howard, "HND tosses record among of paper trash in clean-up," Bulletin, May 1993, p. 7; Bulletin, Apr. 1994, p. 1; "CEHND wins $50,000," Bulletin, Mar./Apr. 1995, p. 2; Interview with Betty Neff and Donna Rovere by Damon Manders, June 10, 1998; Brightening our Future ... Partners for Success (Huntsville, AL: U.S. Army Engineer Division, 1993); Army Communities of Excellence: Partners for Success ... And a Brighter Future (Huntsville, AL: U.S. Army Corps of Engineers, 1997); "'Quality' initiatives garner two awards," Bulletin, June 1998, p. 1.

3. Wilson, ed., Annual History 1993, p. 60; Brightening our Future, p. 5; Barbara Glen, " FWP sets theme for Women's History Month," Bulletin, Jan. 1993, p. 6; Glenn, "FWP announces first quarter's programs," Bulletin, Feb. 1993, p. 8; Howard, "New Hispanic Employment Program Manager," Bulletin, Feb. 1993, p. 8; APIC 1996, p. 55; APIC 1997, p. 37; Partners for Success, pp. 8-9; Interview with Bob DiMichele, Huntsville, AL: Sept. 5, 1998; "Education program opens Corps doors for students," Bulletin, June 1998, pp. 1, 12. See also the "Professional and Community Notes" and "People News" announcements in the Huntsville Bulletin from 1993-1997.

4. Diane Bavis, "LMI class visits Mobile District's test facility and Nashville District," Bulletin, Jan. 1994, P. 7; "Nine HND employees selected for 1994-95 LMI class," Bulletin, Feb. 1994, p. 4; Barbara Glenn, "LMI tours 'team-work-minded' Saturn plant," Bulletin, Oct./Nov. 1994, p. 6; "Huntsville Center Leadership Development Program 'Lights the Flame of Learning,'" Bulletin, Apr. 1996, pp. 1, 3; APIC 1995, pp. 23-24; APIC 1996, pp. 30-31; APIC 1997, pp. 23-24.

5. Anna Skonieczny, "Job-related suggestions can earn monetary awards," Bulletin, Aug. 1993, p. 5; "Ideas worth more than the dollars they save," Bulletin, Nov./Dec. 1996, p. 9; "The 'We' suggestion receives high visibility in Huntsville Division," Bulletin, Aug. 1993, p. 5; Shonieczny, "AIEP," Bulletin, Nov. 1993, p. 13; Brightening our Future, p. 6; Partners for Success, p. 13; Skonieczny, "AIEP evaluators key element to successful program," Bulletin, Dec. 1994, p. 8; "Army Ideas for Excellence Program Adapts to Total Quality Management," Bulletin, Mar. 1996, p. 8; Personal Communication, Bob DiMichele to Damon Manders, Huntsville, AL: Oct. 21, 1998. In many ways, the transition to TQM did not improve AIEP's efficiency, as it often took longer to evaluate and implement useful ideas.

6. Manders, p. 10; Wilson, ed., Annual History, 1993, p. 56; APIC 1995, p. 42; APIC 1996, p. 53.

7. Interview with Jim Wilson, Huntsville, AL: June 21, 1998; Howard, "HND Commander's Conference to have employee input," Bulletin, July 1993, p. 12; Brown, "Commander's Column," Bulletin, Nov. 1993, p. 2; AR 5-1, Army Management Philosophy; Leadership for Total Army Quality, (n.p.: Department of the Army, n.d.), pp. 1-2; Judy Wilson, "CWS efforts now under TQM umbrella," Bulletin, Feb. 1994, p. 8; "TQM: A Challenge to Commitment,"

Quality Times, May 1994, p. 1; "How is TQM Organized," Quality Times, May 1994, p. 2; "Who is PAT?" Quality Times, May 1994, p. 3; Partners for Success, pp. 7-8; APIC 1996, p. ii.

8. Interview with Wilson; Diane Hesler, "Quality Corner," Bulletin, July 1997, p. 8; Hesler, "Quality Corner," Bulletin, Nov. 1997, p. 8. For examples of TQM improvements, please see the 1995 issues of the Quality Times. It should be noted that there were only four issues of the Quality Times from 1994-1995. The "TQM" or "Quality Corner" columns were regular features of the Bulletin beginning in May/June 1996.

9. Mark Graham Brown, The Baldrige Award Winning Quality: How to Interpret the Baldrige Criteria for Performance Excellence, 7th ed. (New York: Quality Resources and ASQC Quality Press, 1997), pp. vii, 1-11. The Commerce Department's National Institute for Standards and Technology managed the Baldrige competition. Over the years, winners have included AT&T, Corning Telecommunications, Zytec Corporation, Cadillac Motor Car Company, Federal Express, Motorola, and Westinghouse.

10. Interview with Betty Neff and Donna Rovere by Damon Manders, June 10, 1998; "Army develops performance improvement criteria," Bulletin, Sept./Oct. 1995, pp. 1, 3; Brightening Our Future, pp. 1-5, 7, 15-20; Partners for Success, p. 9; APIC 1995, pp. 22-24; APIC 1996, pp. 11-12, 30-32.

11. Interview with Neff and Rovere, June 10, 1998; "Army develops performance improvement criteria," Bulletin, Sept./Oct. 1995, pp. 1, 3; Huntsville Center, Army Performance Improvement Criteria: Our Vehicle to the Future ... (Huntsville, AL: CEHNC-PAO, n.d.), p. 1; Brightening Our Future, pp. 10-12.

12. Cunningham, "Viewpoint," Bulletin, May/June 1997, p. 2; Interview with Neff and Rovere; Bob DiMichele, "TQM Corner," Bulletin, May/June 1996, pp. 5, 6; APIC 1995, pp. 10, 58, and 64; APIC 1996, pp. 3 and 17; APIC 1997, pp. 15, 31, and 32; "Awards no longer linked to '360' ratings," Bulletin, May/June 1997, pp. 3 and 6; "Rating cycle approaches with changes to 360 process," Bulletin, Oct. 1997, p. 1.

13. Interview with Neff and Rovere; APIC 1995, pp. 1-2, 13-17, and 34-5; APIC 1996, pp. 1-2 and 38-40; APIC 1997, pp. 1-2 and 26-28. An example of a directorate level PAT was the Engineering Directorate tasking PAT which studied in 1996 how tasks were assigned; a cross-functional PAT may occur within a specific directorate but would concentrate on Center-wide processes, an example being the Travel PAT, which studied how the travel process could be improved in 1995.

14. Interview with Neff and Rovere; Neff, "Teaming takes training, planning, and commitment," Bulletin, Mar. 1996, pp. 5-6; Teams Work Implementation Plan, Jan. 19, 1996 (Installation Historical Files, Team Conception: 1996); APIC 1995, p. 21; APIC 1996, pp. 7, 27-28; APIC 1997, p. 21. The Team Concept Training Program, developed by PDS, Inc. out of Clearwater, Florida, included 20 one-hour modules.

15. Interview with Neff and Rovere; "Visions Developed for Product Lines," Bulletin, May/June 1996, pp. 7-8; APIC 1997, pp. i-iii.

16. APIC 1996, pp. 42-43, 48-50; Cunningham, "Commander's Column," Bulletin, July 1995, p. 2.

17. "Army Performance Improvement Criteria," Bulletin, Oct./Nov. 1995, p. 6; "Army Performance Improvement Criteria," Bulletin, Jan. 1996, p. 1; DiMichele, "APIC starts to fill in the gaps," Bulletin, Jan. 1996, p. 7; "Huntsville places in ACOE," Bulletin, May/June 1997, p. 1; "Audit office named best in the Army," Bulletin, May/June 1997, p. 2; "HNC makes first cut for Presidential Quality Award," Bulletin, Aug. 1997, p. 3; Interview with Neff and Rovere.

18. APIC 1996, pp. 50-53, 65-68; APIC 1997

Notes to Chapter 4

1. Personal Communication, John Samuelson to Damon Manders, Huntsville, AL: Aug. 31, 1998; Interview with Ronn Brown, Huntsville, AL: June 21, 1998; Commander's Fact Sheet, Computer Aided Drafting and Design (CADD), Jan. 30, 1993; Fact Sheet, CADD, Apr. 30, 1993.

2. Manders, p. 37;

3. Manders, pp. 37-38; Commander's Fact Sheet, DD1391 Processor, Apr. 30, 1993; Interview with Garry Runyans, Huntsville, AL: June 26, 1998; Information Paper, PAX System (April 1998), pp. 11-13.

4. Fact Sheet, DD1391, Jan. 31, 1993; Fact Sheet, DD1391, Apr. 30, 1993; Fact Sheet, DD1391, Jan. 31, 1994; Fact Sheet, DD1391, Oct. 31, 1995; Information Paper, PAX System, pp. 1-4; Personal Communication, Nancy Turner to Damon Manders, Huntsville, AL: June 29, 1998. The construction programs supported included Military Construction, Army; Production Base Support; Army Family Housing; Non-Appropriated Funds; Maintenance and Repair; Army and Air Force Exchange Service; Medial Facilities; Defense Logistics Agency; Commercially-Financed Facilities; Base Closure, Army; Special Operation Program; Section 6 Schools; Defense Finance and Accounting Service; Payment in Kind; Barracks Upgrade Program; Ballistic Missile Defense Organization; Chemical Demilitarization; National Missile Defense; Theater Missile Defense; and Relocatable Buildings.

5. Manders, p. 38; Commander's Fact Sheet, Economic Analysis System (ECONPACK), Jan. 31, 1993; Fact Sheet, ECONPACK, July 29, 1994; Fact Sheet, ECONPACK, Oct. 31, 1995; Information Paper, PAX System, pp. 5-7; Personal Communication, Turner to Manders.

6. Manders, p. 38; Commander's Fact Sheet, ENG 3086 Processor, Jan. 31, 1993; Fact Sheet, ENG 3086, Apr. 28, 1995; Information Paper, PAX System, pp. 8-10; Personal Communication, Turner to Manders.

7. Manders, p. 38; Commander's Fact Sheet, Army Criteria Tracking System (ACTS), Jan. 31, 1993.

8. Manders, p. 38; Commander's Fact Sheet, Computer Aided Cost Estimating System (CACES), Jan. 31, 1993; Personal Communication, Jim Nichols to Damon Manders, Huntsville, AL: June 27, 1998. The Center also supported and developed numerous applications related its

other programs, such as the RTLP and AFCS (see ch. 10), which will be discussed in the context of these programs.

9. Fact Sheet, CACES, July 30, 1993; Fact Sheet, CACES, July 29, 1994; Fact Sheet, CACES, Apr. 28, 1995; Fact Sheet, TRACES, July 31, 1995; Personal Communication, Nichols to Manders.

10. Manders, p. 38; Commander's Fact Sheet, Engineer Management Automation Army Reserve (EMAAR), July 30, 1993; Fact Sheet, EMAAR, Oct. 31, 1993; Fact Sheet, EMAAR, Apr. 28, 1995; "Quality Research the best small business in technology services," Bulletin, Sept./Oct. 1996, p. 14; Personal Communication, Carey Klug to Damon Manders, Huntsville, AL: June 29, 1998; Personal Communication, Lein to Manders.

11. Manders, p. 39; Wilson, Annual History, 1993, pp. 50-53; Ken Crawford, "CEFMS -- not an acronym from Hades," Bulletin, Dec. 1993, p. 3; "Paul Linderman talks about CEFMS," Bulletin, Dec. 1993, pp. 3, 5; Brightening our Future, p. 9; Interview with Joslin; Interview with Tommy Pond, Huntsville, AL: July 6, 1998.

12. Wilson, Annual History, 1993, p. 53; Brown, "Commander's Column," Bulletin, Jan. 1994, p. 2; "Corps of Engineers Financial Management System is the Best Game in Town," Bulletin, Jan. 1996, p. 1; Cunningham, "Commander's Column," Bulletin, May/June 1996, p. 2; Interview with Joslin.

13. Brown, "Commander's Column," Bulletin, Feb. 1994, p. 2; Interview with Col. Duncan Brown by Robert DiMichele, May 9, 1995 (videocassette); Howard, "Video-teleconferencing system to let Huntsville Division meet with world," Bulletin, May 1993, pp. 1, 5.

14. Wilson, Annual History, 1993, p. 56; Brightening our Future, pp. 6, 8, and 12; APIC, 1996, p. 28; Personal Communication, Samuelson to Manders.

15. "The Internet and the World Wide Web," Bulletin, Sept./Oct. 1996, p. 9.

16. "The Internet and the World Wide Web," Bulletin, Sept./Oct. 1996, p. 9; "Electric Solicitation Hits the Information Highway," Bulletin, Feb. 1996, p. 4. See the HNC homepage at http://www.hnd.usace.army.mil.

17. "Huntsville Division's technical information center goes on-line," Bulletin, May/June 1995, p. 7.

18. Personal Communication, Samuelson to Manders; Henritta Wright-Cometa, "Updated version of SAACONS introduced in CEHND," Bulletin, Feb. 1995, p. 6.

19. Interview with Ron Brown; APIC 1997, p. iii, 19; "Fiscal Year 1996 Defense Authorization Bill," Bulletin, Mar. 1996, p. 3; 1997 Historical Report for the Civilian Personnel Advisory Center; Personal Communication, Samuelson to Manders. Through the use of the Programs and Project Management Information System (PROMIS), installed in 1997, IM was able to better track and sustain system upgrades, which would continue on a quarterly basis.

20. Interview with Ron Brown; Brightening our Future, p. 8; Debra Hendry, "Computer survey to be held in October," Bulletin, Aug. 1993, p. 7; Alicia Allen, "LMI Computer survey completed," Bulletin, Nov. 1993, p. 11

21. "Paul Linderman talks about CEFMS," Bulletin, Dec. 1993, p. 3; Rachard Pitruzzello, "Antibiotics cannot control these viruses," Bulletin, Mar./Apr. 1995, p. 6; "What is a Computer Virus," Bulletin, Aug./Sept. 1995, p. 5; "Computer Virus," Bulletin, Sept./Oct. 1995, p. 8. See other IM Columns from the Bulletin, 1995-1997.

Notes for Chapter 5

1. Command briefing, March 20, 1997.

2. Manders, pp. 24-26.

3. Manders, p. 26; Interview with Col. Brown. The reason multiple plants were chosen over transporting arms to a central disposal facility, according to a Senate report on the 1996 defense authorization bill, was that "the committee is convinced that armed convoys of lethal chemical weapons moving through hundreds of miles of populated cities and counties is unacceptable," Huntsville Times, Mon., Oct. 9, 1995, p. B1.

4. Manders, p. 26; Joseph Bauman, "Nervous breakdown," Salt Lake City Desert News, Aug. 22, 1996, pp. A19-A20.

5. Manders, pp. 26-27; Commander's Fact Sheet, Jan. 31, 1993; Fact Sheet, July 31, 1995; Fact Sheet, Oct. 31, 1996; Wilson, Annual History, 1993, p.; Interview with Phil Brown, Huntsville, AL: July 15, 1998.

6. Ken Crawford, "Report recommends burning chemical agent, studying alternatives," Bulletin, Feb. 1994, p. 6; Public Affairs Office Fact Sheet, Chemical Demilitarization, August 1997.
7. Manders, p. 26; Huntsville Division Annual Report, 1994 (Huntsville, AL: CEHNC-PAO, 1995); "Building a Safer Tomorrow," Bulletin, Mar. 1996, pp. 1, 6; APIC 1995, p. 20; 1997 Historical Report for the Civilian Personnel Advisory Center; Interview with Phil Brown; Assembled Chemical Weapons Assessment Program, Annual Report to Congress, December 1997 (Washington D.C.: Department of Defense, 1997), pp. vi-viii, 2-6.

8. Manders, pp. 26-28; Commander's Fact Sheet, Chemical Demilitarization, June 30, 1994; Personal Communication, Curt Murdock to Damon Manders, Aug. 6, 1998,

9. Manders, p. 29; Commander's Fact Sheet, Chemical Demilitarization, Jan. 31, 1993; Fact Sheet, Chemical Demilitarization, July 31, 1995; Howard, "JACADS hurricane scare prompts quick reaction," Bulletin, Sept. 1994, p. 8; Wilson, Annual History 1993, p. 1; "U.S. Chemical Weapons Stockpile Information Declassified," Bulletin, Feb. 1996, p. 6; Personal Communication, Jerry Mullinex to Damon Manders, Huntsville, AL: Aug. 20, 1998.

10. Judy Wilson, "Lt. Gen. Williams dedicates Tooele Chem-Demil plant," Bulletin, Aug. 1993, p. 1; Manders, pp. 27-28; Wilson, Annual History 1993, pp. 1-2; Robert Smith, "Additional demister installed at Tooele," Bulletin, Mar./Apr. 1995, p. 4; Bob DiMichele, "Chemical Demilitarization Expert Retires," Bulletin, Apr. 1996, pp. 2, 6, and 11; Fact Sheet, Chemical

Demilitarization, July 31, 1995; "Chemical weapons destruction begins at Tooele," Bulletin, Sept./Oct. 1996, pp. 5-6; Personal Communication, Mullinex to Manders. Smith quoted in DiMichele, "Expert Retires," p. 6.

11. Manders, p. 29; Bob Howard, "HND Construction Division ready for Anniston project to commence," Bulletin, Mar. 1994, p. 1; Jerry Kresge, "Chem Demil Welcomes first Anniston Resident Engineer," Bulletin, Feb. 1994, p. 7; Evelyn Harris "Anniston's Chem Demil plant in President's '94 Budget," Bulletin, May 1993, p. 8; Fact Sheet, Chemical Demilitarization, July 31, 1995; Richard Moore, "Equipment purchased for Chem Demil facilities," Bulletin, Feb. 1994, p. 7; "Army Awards Anniston Chemical Agent Disposal Facility Contact," Bulletin, Mar. 1996, p. 1; "Building a Safer Tomorrow," Bulletin, Mar. 1996, pp. 1, 6; "Building a safer tomorrow: Construction begins on Anniston chem demil facility," Bulletin, July 1997, p. 1; Personal Communication, Mullinex to Manders. Part of the delay in obtaining a RCRA permit at Anniston was the permit application relying on Fort McClellan in Anniston for emergency services. When this base was named for closure in the 1994 round of base closings, the Alabama Department of Environmental Management required a contingency plan; Martin Burkey, "Army incinerator caught on planning snag," Huntsville Times, Aug. 3, 1995, p. B2.

12. "Army breaks ground to build chemical disposal facility," Bulletin, May/June 1997, p. 1; PAO Fact Sheet, Chemical Demilitarization, Chemical Demilitarization Directorate, Aug. 31, 1997; Wilson, Annual History 1993, p. 2; Commander's Fact Sheet, Chemical Demilitarization Directorate, Sept. 18, 1997; Personal Communication, Mullinex to Manders.

13. "Contract for Arkansas chem demil facility awarded to Raytheon," Bulletin, Aug. 1997, p. 3; Wilson, Annual History 1993, p. 2; Commander's Fact Sheet, CSDP, July 31, 1995; PAO Fact Sheet, Chemical Demilitarization, Aug. 1997; Commander's Fact Sheet, Chemical Demilitarization Directorate, Dec. 18, 1997; Personal Communication, Mullinex to Manders.

14. Manders, p. 27. In some instances, the leaks exposed limited numbers of workers to minute amounts of chemical agents. In one case in Anniston, one man was hospitalized, though he was released the following day. Andy Powell, "60 evacuated," Gadsden Times, Aug. 2, 1995; "Nerve gas leak 'wake-up call' to community," Gadsden Times, Aug. 3, 1995, p. B1, (See CEHND-PAO News and Media Releases).

15. Manders, p. 27; "Mouthpiece for Utahns," Tooele Transcript-Bulletin, July 1, 1997, p. 4; Doug Darlington, "Tooele incinerator violations listed in report," East Oregonian, Nov. 20, 1997, p. 4A; David Pace, "Browder: Safety probes won't impede weapons incineration," Huntsville Times, Jan. 4, 1995, p. B2. Some reports published were demonstrably false; see, for example, Tammy Gay, "Anti-incinerator group claims arsenic burned," Richmond Register (Kentucky), June 17, 1997, p. 1.

16. Michael Marvinny, "Speaker's stand ... Un-information," Anniston Star, June 24, 1994, p. 4A; Robert Lawrence, "Speak out ... On incineration's harm," Anniston Star, Sept. 26, 1994, p. 4A; Bill Camp, "Speaker's stand ... Stop delaying," Anniston Star, June 24, 1994, p. 4A; Bob Thompson, "Speak out ... Rebutting Burn Busters," Anniston Star, July 6, 1994, p. 4A; Thorsted quoted in Phil Miller, "Residents Have One Burning Desire: Get Rid Of This Stuff," Salt Lake Tribune, Aug. 23, 1996, p. A1.

17. Anniston woman quoted in Tony Freemantle, "Army fends off critics of chemical-weapons incineration," Arkansas Democratic Gazette, Nov. 27, 1997, p. 2; "Chemical arms burning

opposed," Huntsville Times, Sept. 26, 1994, p. B3; Eric Larson, "Marchers: Bury burning plan," Anniston Star, Sept. 26, 1994, p. 1A; "Lawsuit filed to stop Tooele Chem. Weapons Incinerator; Plaintiffs charge U.S. Army plan would create grave threat to human health and environment," Newswire, May 10, 1996); judge quoted in Freemantle, "Army fends off critics," p. 2.

18. "U.S. Chemical Weapons Stockpile Information Declassified," Bulletin, Feb. 1996, p. 6; Wilson, Annual History, 1993, p. 59; APIC 1996, p. 10; APIC 1997, p. 4; Personal Communication, Robert DiMichele to Damon Manders, Huntsville, AL: Sept. 3, 1998. Gen. Orton quoted in Robert Burns, "Army exposes chemical secret: 30,000 tons worth," Huntsville News, Jan. 23, 1996, p. A1. See also footnote 6 above. In Anniston, a public ground-breaking ceremony did not occur because of concerns that it would aggravate those opposed to the facility.

19. Interview with Joe Conn, Huntsville, AL: July 29, 1998; Manders, p. 27; Commander's Fact Sheet, Chemical Disposal Facilities, Jan. 30, 1993; Bob Howard, "Russian Chem Demil program on schedule," Bulletin, June/July 1994, p. 1.

20. Interview with Conn; Fact Sheet, Chemical Disposal Facilities, Oct. 31, 1993; Fact Sheet, Chemical Disposal Facilities, July 31, 1994; Howard, "Russian Chem Demil program on schedule," Bulletin, June/July 1994, p. 1.

21. Interview with Conn; Fact Sheet, Chemical Disposal Facilities, July 31, 1995; "Russian Chemical Destruction Facility Contract," Bulletin, May/June 1996, p. 9; "Corps awards contract for Russian Chem Demil," Bulletin, Nov./Dec. 1996, p. 3.

22. Personal Communication Joe Conn to Damon Manders, Nov. 30, 1998; Personal Communication, Phil Loftis to Damon Manders, Feb. 24, 1999.

23. Personal Communication, Joe Conn to Damon Manders, Dec. 7, 1998; Manders, p. 27; Howard, "Russian Chem Demil program on schedule," Bulletin, June/July 1994, p. 1. Joe Lofton's description of Russia after his trip to Moscow in 1993 was of a "gray and decrepit" place with crumbling infrastructure and serious economic challenges. Joe Lofton, "Moscow scenes different behind the facade," Bulletin, Nov. 1993, pp. 7-8.

24. Interview with Jarel Starling, by Damon Manders, Huntsville, AL: Aug. 2, 1998; Manders, p. 16; PAO Fact Sheet, Large Rocket Motor Demilitarization, Jan. 1997.

25. Interview with Jarel Starling; Commander's Fact Sheet, Large Rocket Motor Disposal Program, Near Critical Fluid Methods – MICOM support, Starling, 31 Jan. 1993; 29 Oct. 1993; 28 April 1995; [Oct. 1995]. PAO Fact Sheet, Large Rocket Motor Demilitarization, Jan. 1997.

26. Commander's Fact Sheet, Large Rocket Motor Disposal Program, Commercial Mining Applications for Reclaimed Propellant – U.S. Army Defense Ammunition Center and School (USADACS), Savanna, IL, Support, Starling, 29 Oct. 1993; 28 April, 1995.

Notes for Chapter 6

1. Command Briefing, 1993-1997.

2. Manders, p. 19.

3. Manders, pp. 20-21.

4. Commander's Fact Sheets, Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Preliminary Assessment (PA) Phase One, Oct. 31, 1995; PAO Fact Sheet, Environmental Engineering, February 1997; Wilson, Annual History, pp. 24-25; Manders, pp. 19, 21. Of the identified sites, about 950 required ordnance removal, for which HNC was responsible.

5. Manders, pp. 20-21; PAO Fact Sheet, Environmental Engineering, February 1997.

6. Manders, pp. 20-22; Personal Communication, Kim Speer to Damon Manders, Huntsville, AL: Aug. 20, 1998.

7. Manders, pp. 21-22; Personal Communication, Sam Sang to Damon Manders, Huntsville, AL: Dec. 10, 1998.

8. Manders, pp. 21-22; Personal Communication, Marshall Greene to Damon Manders, Huntsville, AL: Sept. 1, 1998.

9. Commander's Fact Sheet, Defense Reutilization and Marketing Service (DRMS) Conforming Storage Program, Oct. 31, 1995; Manders, p. 22; Personal Communication, Greene to Manders.

10. Commander's Fact Sheet, Hazardous Waste Storage Facility (HWSF) McMurdo Station, Antarctica, April 28, 1995; Personal Communication, Marshall Green to Damon Manders, Huntsville, AL: Feb. 26, 1999.

11. Manders, p. 22.

12. Commander's Fact Sheet, Defense Logistics Agency (DLA) – Installation Restoration Program, Apr. 30, 1993; Fact Sheet, DLA-IRP, July 31, 1995. See also the fact sheets for the individual projects attached to the DLA fact sheet for the same months.

13. Interview with David Skridulis, Huntsville, AL: July 29, 1998; Maj. David Sheets, "Defense Distribution San Joaquin – Sharpe, California Management Action Plan," Huntsville, AL: CEHNC-PM-ED, 1998. See also Sheets, "Management Action Plans for Defense Distribution San Joaquin – Tracy, California," Huntsville, AL: CEHNC-PM-ED, 1998; Sandy Olinger, "Defense Supply Center Richmond," Huntsville, AL: CEHNC-PM-ED, 1998; Olinger, "Defense Depot Susquehanna, Pennsylvania," Huntsville, AL: CEHNC-PM-ED, 1998; and Olinger, "Defense Distribution Depot Oklahoma – Atchison Facility," Huntsville, AL: CEHNC-PM-ED, 1998.

14. Commander's Fact Sheet, U.S. Army Materiel Command (AMC) Environmental support, Jan. 31, 1993; Manders, pp. 22-23.

15. Commander's Fact Sheet, AMC Environmental Support, Oct. 29, 1993; Fact Sheet, AMC Environmental Support, Jan. 31, 1994; Manders, p. 23; Wilson, Annual History 1993, p. 14-15; "Line Item Review - Seneca Army Depot Activity (SEDA)," Romulus, NY, Sept. 18, 1997.

16. Wilson, Annual History 1993, pp. 14-23; Interview with Skridulis; Interview with Dorothy Richards, Huntsville, AL: Sept. 22, 1998; Commander's Fact Sheets, AMC Environmental Support, Oct. 29, 1993-Oct. 31, 1995. See also the fact sheets for the individual AMC projects.

17. "Line Item Review - Redstone Arsenal (RSA)," Sept. 18, 1997; Wilson, Annual History 1993, pp. 14-23; Interview with Skridulis; Interview with Dorothy Richards, Huntsville, AL: Sept. 22, 1998; Commander's Fact Sheets, AMC Environmental Support, Oct. 29, 1993-Oct. 31, 1995.

18. "Line Item Review - SEDA"; Commander's Fact Sheets, AMC Environmental Support, Oct. 29, 1993-Oct. 31, 1995; Wilson, Annual History 1993, pp. 14-23; Interview with Skridulis; Interview with Dorothy Richards, Huntsville, AL: Sept. 22, 1998.

19. Commander's Fact Sheet, Environmental Policy Development Support, Office of the Deputy Assistant Secretary of Defense for Environmental Affairs (ODASD[E]), Jan. 31, 1993; Personal Communication, Alicia Allen to Damon Manders, Huntsville, AL: Aug. 31, 1998; Manders, p. 23.

20. Commander's Fact Sheets, Environmental Policy Development Support, ODASD(E), July 29, 1994-July 31, 1995; Personal Communication, Allen to Manders.

Notes to Chapter 7

1. Annual Report 1994, Ordnance and Explosive Waste Mandatory Center of Expertise and Design Center (Huntsville, AL: U.S. Army Engineer Division, Huntsville, [1995]), p. 2; Manders, p. 21.

2. Robert Nore, "Developing a Center of Expertise," Paper delivered at the 27th Explosives Safety Seminar, Las Vegas, Nevada: 1996, p. 1; Annual Report 1994, OEW, pp. 4-5; Manders, p. 21. HNC was also named Technical Center of Expertise (TCX) for Explosive Safety with responsibilities to provide technical assistance and design review in support of the Protective Design MCX at Omaha District. PAO Fact Sheet, Explosive Safety Technical Center of Expertise, April 1997. However, many MCX employees served in this capacity, and in fact there was a great deal of blending of responsibilities with the MCX.

3. Annual Report 1994, OEW, pp. 1-2, 7-8; Interview with John Loyd, Huntsville, AL: Sept. 10,1998; Nore, "Developing a Center of Expertise," p. 2; CEHND Regulation 10-1-2, Organizations and Functions, U.S. Army Engineer Division, Huntsville, Jan. 18, 1991.

4. CEHNDR 10-1-2, Change 10, June 5, 1994; Toni Hamley, "OEW MCX Reorganizes to Serve Better," OEW Newsletter, July 1994, p. 4; "OE Program reorganized under team concept," Ordnance Explosives Environment, Oct.-Dec. 1995, p. 1; "Meet the Huntsville Division Ordnance and Explosives Team," OE Environment Oct.-Dec. 1995, pp. 4-5; "Ordnance and Explosives program reorganized under team concept," Bulletin, Sept./Oct. 1995, pp. 3, 11;

Annual Report 1995-1996, Center of Expertise and Design Center (Huntsville, AL: U.S. Army Engineering and Support Center, Huntsville, [1997]), pp. 6-8; Annual Report 1994, OEW, p. 34.

5. Bob DiMichele, "Ordnance and Explosives decentralization begins," Bulletin, Sept./Oct. 1996, p. 4; "Corps selects regional ordnance and explosives design and execution districts," OE Environment, Jan.-Mar. 1997, p. 1; "OE Program decentralization postponed," OE Environment, Apr.-Jun. 1997, p. 1.

6. Annual Report 1994, OEW, pp. 4-5, 9-10; Annual Report 1995-1996, MCX, pp. 24-31; "Time-critical removal action defined by new policy," OEW Newsletter, Oct.-Dec. 1994, p. 5; Debra Hendry, "Archives Search Guidance To Be Released Soon," OEW Newsletter, July 1994, p. 5; "MCX Issues Environmental Compliance Policy," OEW Newsletter, July 1994, p. 5; Commander's Fact Sheet, Ordnance and Explosives Center of Expertise – Policy and Guidance Documents, Oct. 31, 1996. In addition to DOD and EPA policies, the Center also distributed its own guidelines in several articles in the OEW Newsletter, 1994-1997.

7. Nore, "Developing a Center of Expertise," pp. 2-3; Sandy McAnally, "OEW Workshops Focus on Hazard and Safety Awareness," OEW Newsletter, July 1994, p. 5; Annual Report 1994, OEW, pp. 25-26.

8. Susan Henderson quoted in Fred Thomas, "Neighbors Fear Ex-Depot is Time Bomb," Omaha World Herald, Oct. 18, 1993, pp. 1-2; Bill Harlan, "Dead sheep a mystery," Rapid City Journal (SD), May 11, 1994, p. 1; CEHND-PA Trip Report, Jan. 31, 1994 (News and Media Releases: Blackhills Army Depot, 1993); Berny Morson, "State orders Army to clean up bombing range," Rocky Mountain News (Denver), June 11, 1997, p. 5A; Matthew Voletich, "Army Corps says Lowry Bombing Range closer to clean," Aurora Sentinel (CO), May 28, 1997, p. 3; Alisha Jeter, "Hiker hurt by shell 'serious' after surgery," Rocky Mountain News online (News Media and Releases: Buckly/Lowry, 1996); Bill Scarlos, "State sues to force munitions cleanup," Rocky Mountain News,, June 25, 1997, p. 1A; Carson Walker, "Daschle wants probe of cleanup," Sioux Falls Argus Leader (SD), May 11, 1994, p. 1A.

9. Memorandum, Huntsville Public Affairs Office (PAO) support to geographic districts, Sept. 2, 1993; Personal Communication, Bob DiMichele to Damon Manders, Huntsville, AL: Sept. 3, 1998; Annual Report 1994, OEW, pp. 27-28; Bob DiMichele, "How to Meet the Press and Survive," OEW Newsletter, July-Sept. 1995, p. 1, 7; DiMichele, "Public involvement planning makes the difference," OE Environment, Oct.-Dec. 1995, p. 1, 6; Anne Camden, "Involving the community," OEW Newsletter, Oct.-Dec. 1994, p. 8; Thomas DeWitte, "Web site provides quick access to FUDS info," OE Environment, Oct.-Dec. 1997, p. 2; Annual Report 1995-1996, MCX, pp. 39-42; Nore, "Developing a Center of Expertise"; CEHND-PA Trip Report, Jan. 31, 1994; CEHND-PA Trip Report, May 5, 1994; "Environmentalists should be interested in Igloo clean-up," (News and Media Releases: Black Hills Army Depot, 1993); Robert D. Voltz, District Engineer, to Bonnie Rader, Sept. 19, 1997 (News and Media Releases: Buckly/Lowry, 1996). The OEW Newsletter was renamed the Ordnance Explosives Environment in Dec. 1995.

10. Annual Report 1994, OEW, pp. 28-29; Annual Report 1995-1996, MCX, p. 36. Most of the funding for these activities came from Operation and Maintenance, Army (OMA) or Other Procurement, Army (OPA).

11. Betty Neff, "Looking underground with Ordnance GIS," OEW Newsletter, Apr.-June 1995, p. 4; Neff, "OE Knowledge Base: Creating software that learns," OE Environment, Jan.-Mar.

1997, p. 2; Thomas Bell and Bruce Barrow, "Model-based processing helps new UXO sensors separate ordnance from scrap," OE Environment, July-Sept. 1997, p. 3; Bell, "Looking for a perfect match," OE Environment, Apr.-June 1997, p. 5; Annual Report 1995-1996, MCX, p. 36-37.

12. Joe Serena, "Blast containment structure passes proof test," OE Environment, Apr.-June 1996, pp. 2-3; Arkie Fanning, "Vapor containment structures: 99.47-percent effective," OEW Newsletter, Oct.-Dec. 1994, pp. 1-2; Annual Report 1995-1996, MCX, p. 37-38.

13. Kim Speer, "From a distance: remote video inspection," OE Environment, July-Sept. 1997, pp. 5-6; Tommy Hunt, "X marks the spot," OE Newsletter, July-Sept. 1995, p. 5; Arkie Fanning, "How computers may make digging old-fashioned," OEW Newsletter, Jan.-Mar. 1995, p. 5; Annual Report 1994, OEW, pp. 28-33; Annual Report 1995-1996, MCX, p. 37-38

14. Personal Communication, Bob Britton to Damon Manders, Huntsville, AL: Sept. 3, 1998; Annual Report 1994, OEW, pp. 12-13; Annual Report 1995-1996, MCX, pp. 4-5.

15. Betty Neff, "Getting our money's worth: Part I, preliminary assessment," OEW Newsletter, Apr.-June 1995, p. 6; Neff, "Getting our money's worth: Part II, archives searches," OEW Newsletter, July-Sept. 1995, pp. 2-3; Cliff Doyle, "Archives search report: a safe bet for BRAC," OE Environment, Oct.-Dec. 1996, p. 1; Sandy McAnally, "Getting our money's worth, Part III, EE/CA's," OE Environment, Oct.-Dec. 1995, pp. 2-3; Arkie Fanning, "Risk Vs. Cost: How Does It Rate?" OEW Newsletter, July 1994, p. 6; Neff, "Getting our money's worth: removal actions," OE Environment, Apr.-June 1996, p. 7; Margaret Simmons, "EOD: Who, What, Where, When, Why?" OEW Newsletter, Jan.-Mar. 1995, p. 6; Annual Report 1994, OEW, pp. 12-13. According to Environmental Restoration at Formerly Used Defense Sites (Corps of Engineers: August 1994, p. 3, sites that were not eligible include sites outside of U.S. jurisdiction, sites whose owners have stored wastes or already expended funds on cleanup, sites for which the DoD component accepts restoration responsibility, United Services Organization sites, Civil Works sites, cemeteries, and sites for which no records are available.

16. Annual Report 1994, OEW, pp. 12-13; Personal Communication, Britton to Manders.

17. Annual Report 1994, OEW, pp. 17-18; Annual Report 1995-1996, MCX, pp. 15-16. Because of the enormous number of projects, the site descriptions that follow were chosen because of importance, publicity, and typicality.

18. Manders, p. 23; Annual Report 1994, OEW, pp. 12-13.

19. Annual Report 1994, OEW, pp. 21-22; Annual Report 1995-1996, MCX, p. 19.

20. Annual Report 1994, OEW, pp. 23-24.

21. Annual Report 1995-1996, MCX, pp. 10, 25-27.

22. Annual Report 1995-1996, MCX, pp. 28-31; Ken Crawford, "HND heavily involved in nationally publicized Spring Valley cleanup," Bulletin, Feb. 1993, p. 4; Annual Report 1994, OEW, pp. 14-15; Wilson, Annual History 1993, p. 8.

23. Interview with John Matthews, Huntsville, AL: July 27, 1998.

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1. Kitchens, pp. 114-123, 161-166; Heidish, 22, 25-26; Torres, 5.1-5.5.

2. Wilson, Annual History 1993, pp. 45-49; 1997 Historical Report; Interview with James Reynolds, Huntsville, AL: Sept. 22, 1998. See Chapter 10 for information about the Operation and Maintenance Engineering Enhancement program.

3. Manders, pp. 10-11; Ed Lewis, "Small Business supporter honored by HND," Bulletin, Jan. 1993, p. 6; Annual Report 1995-1996, MCX, p. 12; Wilson, Annual History 1993, p. 48; Interview with Reynolds; Memorandum, Appointment of Small Business Personnel, Nov. 6, 1997 (Installation Historical Files, Small Business Administration (SBA) personnel Assignment, 1997). See also Chap. 2, note 12.

4. Interview with Reynolds; Directorate of Contracting Briefing, Sept. 1998; Personal Communication, Samuelson to Manders.

5. Wilson, Annual History 1993, pp. 45-49; 1997 Historical Report. See chapter nine for a full review of energy programs.

6. Manders, pp. 17-18.

7. Wilson, Annual History 1993, p. 46; Commander's Fact Sheet, Medical Program, Jan. 31, 1995; PAO Fact Sheet, Medical Equipment Acquisition Support, April 1997.

8. Wilson, Annual History 1993, p. 46; Manders, p. 18; Commander's Fact Sheet, Medical Program, Jan. 31, 1995; Bob Howard, "Contracting lands a major piece of work," Bulletin, Apr. 1994, p. 6; Bob Swinea, "Contracts signed for MRI acquisitions," Bulletin, Aug. 1994, p. 5; Personal Communication, Gary East to Damon Manders, Huntsville, AL: Nov. 30, 1998.

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10. Wilson, Annual History 1993, p. 47; Manders, p. 18; Commander's Fact Sheet, A-E Services Contracts for Medical Facilities Planning and Design Services, Jan. 31, 1993; Manders, p. 18; Commander's Fact Sheet, A-E Services Contracts for Medical Facilities Planning and Design Services, Jan. 31, 1995.

11. Interview with Reynolds; Commander's Fact Sheet, Medical Program, Jan. 31, 1995; PAO Fact Sheet, Medical Repair/Renewal Program, April 1997; Memorandum, HNC History, Aug. 28, 1998; APIC 1996, pp. 23, 46; APIC 1997, pp. 27, 41. After 1994, the Real Installed

Equipment Program (RPIE), which involved equipment replacement for Air Force medical facilities, was fulfilled through "tool box" contracts. See Commander's Fact Sheet, Medical Program, Jan. 31, 1995 and Tahir Rizvi, "Huntsville Center Builds Chiller Plant for Kessler AB Medical Center," Bulletin, Apr. 1996, pp. 1, 5.

12. Interview with Reynolds; Interview with Ron Larkin, Huntsville, AL: Aug. 12, 1998.

13. Interview with Reynolds; Personal Communication, Stan Lee to Damon Manders, Feb. 24, 1999; PAO Fact Sheet, Unaccompanied Personnel Housing Furnishings, September 1998. According to one estimate, the cost of the program was $2,483 per soldier served – a saving of more than $600 per soldier.

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2. Kitchens, pp. 151-158; Heidish, pp. 34-39; Torres, pp. 4.17-4.19; Manders, p. 30.

3. Manders, p. 31; Commander's Fact Sheet, Utility Monitoring Control System (UMCS), Oct. 29, 1993. The program was formerly known as the Energy Monitoring and Control system (EMCS) until it was renamed by ER1110-3-109, July 15, 1992; Fact Sheet, UMCS, April 28, 1995.

4. Fact Sheet, UMCS, Arrington, July 31, 1995; Fact Sheet, US Forces Command UMCS, July 31, 1995; PAO Fact Sheet, UMCS, Aug. 1997; 1997 History Report.

5. Manders, p. 32; Interview with Bobby Starling, Huntsville, AL: Aug. 21, 1998; Commander's Fact Sheets, Third Party Contracting (TPC) Starling, Jan. 31, 1993, Jan. 31, 1994, April 30, 1995; Wilson, Annual History 1993, p. 38.

6. Manders, p. 32; Interview with Bobby Starling; Commander's Fact Sheets, Demand Side Management (DSM), Starling, Jan. 31, 1993; April 30, 1995; Wilson, Annual History 1993, pp. 37-38.

7. Commander's Fact Sheet, Energy Conservation Investment Program (ECIP), Oct. 29, 1993; [1995].

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12. Interview with Bobby Starling; APIC 1997, p. 41.

13. Interview with Bobby Starling; Energy Program Fact Card, "MRR," November 1997.

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15. Interview with Bobby Starling; Energy Program Fact Card, "Privatization," November 1993.

16. Manders, p. 32; Commander's Fact Sheet, Defense Fuel Supply Center Program for Development of Pipeline Operations Manuals for Various Defense Fuel Support Points (DFSP), Jan. 31, 1993; Interview with John Thompson, Huntsville, AL: Oct. 1, 1998.

17. Fact Sheets, DFSC Program for Development of Pipeline Operations Manuals for DFSPs, Jan. 31, 1993; July 30, 1993; April 30, 1995; [Oct. 1995]; Becky Breeding, "HND threesome find JP4 pipeline," Bulletin, May 1993, p. 6; Interview with John Thompson.

18. Personal Communication, Starling to Manders; "Energy Team gets 'hammered,'" Bulletin, Aug. 1997, pp. 1, 8.

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13. Personal Communication, Bob Riffel to Damon Manders, Huntsville, AL: Oct. 8, 1998; Personal Communication, Lein to Manders.

14. Manders, p. 36; Commander's Fact Sheet, Criteria Documents Update Program (CDUP), Jan. 31, 1993; Personal Communication, Doug Wilson to Damon Manders, Huntsville, AL: Oct. 5, 1998; Personal Communication, Jim Quinn to Damon Manders, Huntsville, AL: Dec. 16, 1998. According to Quinn, the Notice Program, which is funded by HQUSACE as part of CDUP, has an annual budget of $300,000.

15. Fact Sheet, CDUP, Oct. 29, 1993; Fact Sheet, CDUP, [Oct. 1995]; Personal Communication, Wilson to Manders.

16. Visions and Goals, Criteria Document Update Program (Installation Historical Files: Criteria Document Update Briefing Material, 1997); Personal Communication, Wilson to Manders.

17. Manders, p. 36; Commander's Fact Sheet, Operation and Maintenance Engineering Enhancement (OMEE) program, Jan. 31, 1993; PAO Fact Sheet, OMEE, March 1997; Interview with Tahir Rizvi and John Thompson, Huntsville, AL: Oct. 1, 1998.

18. Commander's Fact Sheet, OMEE, [Oct. 1995]; Interview with Rizvi and Thompson.

19. Interview with Rizvi and Thompson; Overview: Operation and Maintenance Engineering Enhancement (OMEE) Program (HNC: July 1997); see also the program manager's folder and fact sheets. The Year 2000 problem, which has received wide media attention since 1995, is the result of older computer code using a two-digit date field to save space. The difficulty is that computers may read the date field "00" as either 1900 or 2000, resulting in glitches ranging from software or hardware failure to simple date confusion. The problem and solutions are complicated, and since HNC was only beginning to deal with this issue in 1997, it is not discussed in detail here.

20. Interview with Rizvi and Thompson; Personal Communication, DiMichele to Manders. Total amount saved is $14.8 million over three years in the Medical Program, and $18.4 million over six years in the Energy program. For more information about the Medical and Energy programs that use the Simplified Facility Support Process, see Medical Program in chapter eight and Maintenance, Repair, and Renewal in chapter nine.

21. Manders, p. 35; Commander's Fact Sheet, Army Facilities Component System (AFCS), Jan. 31, 1993; Commander's Fact Sheet, AFCS, July 30, 1993; PAO Fact Sheet, AFCS, February 1997.

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2. Manders, p. 13-14; Commander's Fact Sheet, U.S. Army Space and Strategic Defense Command (USASSDC) Program, April 30, 1993.

3. Ibid.

4. Commander's Fact Sheet, National Missile Defense (NMD), Jan. 31, 1993; Commander's Fact Sheet, NMD, Oct. 29, 1993; Manders, p. 15. Because SALT II limited the number of BMD sites, NMD was effectively reduced to defending against limited strikes, for example by rogue nations, rather than a full-scale nuclear attack by a major power.

5. PAO Fact Sheet, Missile Defense Support, August 1997; Interview with John Romeo, Huntsville, AL: Sept. 8, 1998.

6. PAO Fact Sheet, Missile Defense Support, August 1997; Interview with Romeo; Ballistic Missile Defense Program Briefing, Feb. 7, 1997 (Installation Historical Files, Ballistic Missile Defense Program, 1997); "One Team, One Program": Facility and Siting: the 35% Design, May 29, 1998, Videocassette; Personal Communication, John Romeo to Damon Manders, Huntsville, AL: Nov. 30, 1998.

7. PAO Fact Sheet, Missile Defense Support, August 1997; Interview with Romeo; Ballistic Missile Defense Program Briefing, Feb. 7, 1997.

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12. Manders, p. 16; Commander's Fact Sheet, Advanced Technology, Jan. 31, 1993; Interview with John Loyd, Huntsville, AL: September 10, 1998.

13. Commander's Fact Sheet, Advanced Technology, Jan. 31, 1993; Interview with John Loyd; Commanders Fact Sheet, Advanced Technology, July 29, 1994 and Oct. 31, 1997; 1997 History Report. The Center also provided in-house technical support and managed contracts to research issues related to nuclear, biological, and chemical (NBC) effects on strategic equipment and facilities. The last contract, awarded in 1993, involved more than twenty such projects. However, the majority of the work involved the testing of electronics

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15. Interview with Loyd; Commander's Fact Sheet, Advanced Technology, Oct. 29, 1993 and Oct. 31, 1997.

16. Manders, pp. 16-17; Wilson, Annual History 1993, p. 13; Commander's Fact Sheet, NASA Advanced Solid Rocket Motor (ARSM) Project Support, Jan. 31, 1993; Oct. 29, 1993; Jan. 31, 1994.

17. Manders, pp. 40-41; Wilson, Annual History 1993, pp. 10-11; Commander's Fact Sheet, Magnetically Levitated (MAGLEV) Program, Jan. 31., 1993.

18. Commander's Fact Sheet, MAGLEV, Jan. 31., 1993; Bob Howard, "Federal Government cuts MAGLEV -- Alabama shows interest in MAGLEV," Bulletin, Feb. 1994, pp. 1, 4; Commander's Fact Sheet, MAGLEV, [Oct. 1995]; Personal Communication, Richard Suever to Damon Manders, Huntsville, AL: October 5, 1998. The other organizations represented in the meeting with Folsom were the Huntsville Airport Authority, UAH, Grumman Corporation, the Huntsville City Council, MICOM, NASA, and the State Senate. In 1994, Fob James was elected governor, and MAGLEV never resurfaced in relation to the Memphis-Atlanta Highway.

19. Paige Johnson, NMD program manager for real property engineering and construction, quoted from "One Team, One Program."

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2. "'Quality' initiatives garner two awards," pp. 1, 9; Col. Walter Cunningham, "Viewpoint," Bulletin, June 1998, p. 2; "Army Corp of Engineers, Engineering and Support Center, Huntsville, Alabama, to Receive Federal Quality Award," OPM News Release, June 5, 1998, p. 1.

3. Susan Elizabeth Hopton, "Army commands receive presidential awards," Army News Service, June 19, 1998, pp. 1-2.

4. Interview with Walter Cunningham.

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Defense Reutilization and Marketing Services (DRMS)

Demand Side Management (DSM)

Department of the Army (DA)

Department of Defense (DOD)

Department of Defense Appropriations Act

Department of Energy (DOE)

Department of Transportation

Deputy Chief of Staff for Industrial Readiness

Deputy Undersecretary of Defense for Environmental Safety

Director of Army Ranges and Targets

Division's Urgent Move Project (DUMP)

ECONPACK

Electronic Security Systems (ESS)

Energy Conservation Investment Program (ECIP)

Energy Policy Act of 1992

Energy Savings Performance Contracting (ESPC)

Energy and Water Development Appropriation Act of 1996

ENG3086 Processor

Engineering Directorate (ED)

Engineering Management Automation, Army Reserve (EMAAR)

Engineering Evaluations/Cost Analysis (EE/CA)

Engineer Regulation (ER)

Engineering Topographical Laboratory (ETL)

Environmental Protection Agency (EPA)

Equal Employment Opportunity Officer

Information Management, Directorate of (IM)

Information Technology Investment Portfolio System

Innovative Technology

In-progress Reviews (IPR)

Installation Restoration Program (IRP)

Internet

Intrusion Detection System (IDS)

Johnson, Lyndon

Johnston Island

Johnston Atoll Chemical Arsenal Disposal System (JACADS)

Kitchens, James

Leadership Development Program (LDP)

Leadership Management Intern

Life Cycle Project Manager (LCPM)

Livingstone, Susan, Assistant Secretary of the Army for Installation Logistics and Environment

Local Area Network (LAN)

Low Altitude Defense System (LoADS)

Logistics Management, Directorate of (LM)

Major Commands (MACOM)

McMurdo Station, Antarctica

MacNamara, Robert

Magnetically Levitated (MAGLEV)

Magnetic Resonance Imaging

Maintenance, Repair, Renewal

Management Coordination Group (MCG)

North Atlantic Division (NAD)

Norton, Col. Leo

No-Upset Processor

Occupational Safety and Health Agency (OSHA)

Office of Counsel (OC)

Office of the Chief, Army Reserve (OCAR)

Office of the Deputy Assistant Secretary of Defense for Environmental Studies (ODASD[ES])

Office of the Secretary of Defense (OSD)

Office of the Surgeon General (OTSG)

Operation and Maintenance (O&M)

Operation and Maintenance Engineering Enhancements (OMEE)

Operational Verification Testing (OVT)

Ordnance and Explosives (OE)

Orton, Maj. Gen. Robert

Pacific Ocean Division (POD)

Patriot Advanced Capability-3 (PAC-3)

Personal Process Improvement

Pine Bluff Arsenal, Arkansas

Poteat, Col. John

President's Quality Award (PQA)

Privatization

Process Action Team (PAT)

Production Base Support (PBS)

Professional Development Support Center (PDSC)

Programming, Administration, and Execution (PAX)

Resident Management System (RMS)

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SAFEGUARD

Scope of Work (SOW)

Secretary of the Army

Secretary of the Army, Research, Development and Acquisition (SARDA)

Security and Law Enforcement, Office of (SL)

SENTINEL

Shared Energy Savings (SES)

Shchuche'ye Chemical Weapons Storage Facility

Simulated Equipment Test Hardware (SETH)

Sketo, Ron

Small Disadvantaged Business Utilization Office (SDBUO)

Society of American Military Engineers (SAME)

South Atlantic Division (SAD)

South Pacific Division (SPD)

Southwestern Division (SWD)

Southwest Institute (SWI)

Space Based Laser-Test (SBL-T)

Standard Army Automated Contracting System (SAACONS)

Standing Operating Procedure (SOP)

Strategic Arms Limitation Treaty (SALT)

Strategic Defense Initiative (SDI)

Strategic Defense Initiative Organization (SDIO)

Superfund Amendments and Reauthorization Act (SARA)

Tax Reform Act of 1986

Technical Center of Expertise (TCX)

Technical Evaluation Board (TEB)

Technical Information Center (TIC)

Technical Manager (TM)

Theater Construction Management System (TCMS)

Theater High Altitude Area Defense (THAAD)

Theater Missile Defense (TMD)

Tom Bevill Center

Tooele Chemical Demilitarization Facility (TOCDF)

Tool Box Contracts

Torres, Louis

Total Army Personnel Evaluation System (TAPES)

Total Labor Multiplier (TLM)

Total Quality Management (TQM)

Tri-Services Automated Cost Engineering System (TRACES)

Umatilla Chemical Depot, Oregon

University of Alabama in Huntsville (UAH)

U.S. Army Intelligence Command (INSCOM)

U.S. Army Missile Command (MICOM)

U.S. Army Reserve Command (USARC)

U.S. Army Space and Strategic Defense Command (USASSDC)

U.S. Army Technical Center for Explosive Safety (USATCES)

Glossary

ACASS
A-E Contract Administration Support System
One of several electronic systems for supplier evaluation. They are corporate databases accessible via desktop computers to all workers needing data.

ACOE
Army Communities of Excellence
An Army program that recognizes exceptional achievement by installations/organizations across a variety of areas using internationally recognized standards of business quality to measure achievement.

ACPERS
Army Civilian Personnel System
A personnel database containing information relating to salaries, promotions, date of birth, years of service, training and education, etc. This information is used to manage all personnel and training actions. Data are available by request from the personnel services provider.

A-E
Architect-Engineer
A term that describes the technical training of an individual or the focus of a contract or business based in the science of architecture and engineering.

AEC
Army Environmental Center
The primary policy and guidance agency for the Army on environmental issues and programs.

AFCS
Army Facilities Components System
An engineering construction support program for Army construction in a theater of operations, or war zone.

AIEP
Army Ideas for Excellence Program
A program that encourages employees to submit job-related ideas to improve operations or reduce expenses. Ideas are eligible for awards under AIEP.

AMEC
Army Management Engineering College

AMC
Army Materiel Command

The major Army command that oversees and manages the research, development and acquisition of non-major systems and equipment as well as technologies; and provides equipment and services to other nations through the Security Assistance Program.

AO
Audit Office
The Huntsville Center office that serves as advisor to the commander and his staff by performing audits and internal reviews, troubleshooting special problem areas requiring independent assessment, and providing liaison with external audit agencies.

APAP
Army Pollution Abatement Program
The program that guides practices and efforts to reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water, or other resources.

APIC
Army Performance Improvement Criteria
Measurement criteria modeled after the standards of the internationally recognized Malcolm Baldrige criteria for business quality.

AR
Army Regulation
Regulatory guidance distributed by Department of the Army in numbered publications.

ARMIS
Army Resource Management Information System

ARNG
Army National Guard
Citizen-soldier organization that serves the nation as a part of the military force and the states providing emergency response.

ASG
Administrative Support Group
An organization that includes all employees not covered in a career program. The objectives of the group are to provide a forum to discuss career issues and initiatives, provide a means of upward and downward communication, exchange information on processes or policy affecting administrative and clerical personnel, and provide recommendations to managers for improving administrative procedures.

ASTM
American Society for Testing and Materials
A developer and provider of voluntary consensus standards, related technical information, and services having internationally recognized quality and applicability that: promote public health and safety, and the overall quality of life; contribute to the reliability of materials, products, systems and services; and facilitate national, regional, and international commerce.

BMDP
Ballistic Missile Defense Program

Managed by the Ballistic Missile Defense Organization, this program includes test programs for the national missile defense and theater missile defense programs. Huntsville Center provides support conducting siting surveys, special studies, criteria development, preparing facilities designs, and engineering and design during construction of test facilities.

BMDS
Ballistic Missile Defense System
Those family of weapon systems designed to intercept missile targets both within and outside the atmosphere. These systems are managed and developed by the Ballistic Missile Defense Organization.

BRAC
Base Realignment and Closure
A process outlined in public law establishing commissions to review the Secretary of Defense's recommendations for realigning or closing military installations.

CADD
Computer-Aided Drafting and Design
Software computer programs that support architect-engineer drafting and design.

CAMDS
Chemical Agent Munitions Demilitarization System
The facility at Tooele Army Depot, Utah, where the procedures and equipment to be used at the yet-to-be constructed full-scale chemical agent disposal facilities were tested.

CBD
Commerce Business Daily
A daily list of U.S. government procurement invitations, contract awards, subcontracting leads, sales of surplus property and foreign business opportunities.

CBR
Command Business Review

CCASS
Construction Contract Administration Support System
One of several electronic systems for supplier evaluation. They are corporate databases accessible via desktop computers to all workers needing data. CCASS will not have data until construction is completed.

CD
Directorate of Chemical Demilitarization Construction
The Huntsville Center organization responsible for management of the construction of facilities constructed in the Chemical Stockpile Demilitarization Program until formally accepted for systemization by the contracting officer. Serves as a consultant to the Project Manager for Chemical Demilitarization staff, the HNC commander, and director of Chem Demil, on construction issues, policies and management processes.

CDUP
Criteria Document Update Program

A program managed by Huntsville Center to develop and maintain documents, designs and standards that support Corps' and Corps' customers needs. Four distinct programs are involved: criteria documents; standard designs; green building technology; and seismic support.

CE
Corps of Engineers
The Army major command that holds responsibility for military construction, environmental activities, facilities engineering, and real estate; and is the nation's civil works engineers.

CEFMS
Corps of Engineers Financial Management System
The field-level automated financial management system that provides finance and accounting reporting subsystems for all civil, military and reimbursable activities.

CEHNC
Corps of Engineers, Huntsville Center
An engineering and support center that reports to the Headquarters, Army Corps of Engineers. Also, called Huntsville Center.

CENAE
Corps of Engineers, New England Division
A geographic division that reports to the Headquarters, Army Corps of Engineers.

CERCLA
Comprehensive Environmental Response, Compensation and Liability Act
A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The Act addresses contamination from past disposal activities by establishing a federal program to finance the cleanup of contaminated waste sites, setting guidelines for cleaning the sites, and establishing a system of legal responsibility for site cleanup.

CEWES
Corps of Engineers, Waterways Experiment Station
A lab which reports to the Headquarters, Army Corps of Engineers.

CH
Directorate of Chemical Demilitarization Program Management
The Huntsville Center organization that serves as the single point of contact for all Corps of Engineers activities of the Chem Demil Program. This office develops and maintains project management plans, scopes, budgets, schedules, procurement strategies, project management data, standing operating procedures, support agreements and related documents.

CIDP
Cryofracture/Incineration Disposal Plant
A chemical weapon disposal plant in which the weapon is frozen in a cryogenic liquid (a low-temperature refrigerant such as nitrogen), then mechanically crushed and burned in a high-temperature kiln. Huntsville Center helped support its design.

CMR
Command Management Review

Quarterly HQUSACE meetings of Corps commanders to review comparative data. CMR, data are available to employees via a local area network server.

CPFF
Cost-Plus-Fixed-Fee

CPOC
Civilian Personnel Operations Center
The organization that provides personnel support to Army installations and agencies within a designated region. That support includes the automated portion of civilian personnel actions such as recruitment, placement and classification of positions, coordination of region-wide training, processing of awards, and maintenance of official personnel files.

CRB
Contract Review Board

CSI
Customer Satisfaction Index
An index used to track and compare data gathered through the customer satisfaction survey questionnaire.

CT
Directorate of Contracting
The Huntsville Center organization that plans, directs, and accomplishes negotiations, executions/administrations of supply and service-type contracts, including contracting officer responsibilities for a variety of programs.

DA
Department of the Army
The executive part of the Department of the Army at the seat of government and all field headquarters, forces, reserve components, installations, activities and functions under the control or supervision of the Secretary of the Army.

DAIWA
Defense Acquisition Workforce Improvement Act
Public law 101-510, Title 10 U.S.C enacted to improve the effectiveness of the personnel who manage and implement defense acquisition programs. As part of the fiscal year 1991 Defense Authorization Act, it called for establishing an Acquisition Corps and professionalizing the acquisition workforce through education, training, and work experience.

DC
Deputy Commander
Two positions (one a civilian, one a military) reporting directly to the commander. The civilian deputy is responsible for programs and technical management issues; the military deputy is responsible for special staff and internal operations issues.

DDOU
Defense Distribution Depot, Ogden, Utah
An installation that belongs to the Defense Logistics Agency.

DFAS
Defense Finance Accounting Service
The organization that provides payroll, travel reimbursements, and other cash payments to personnel within a designated region.

DFSC
Defense Fuel Supply Command (I can locate no such organization. It's possible the author meant the following organization)

DESC
Defense Energy Support Center
The Defense Logistics Agency organization that provides the Department of Defense and other government agencies with comprehensive energy support worldwide.

DI
Design Index

DLA
Defense Logistics Agency
A logistics combat support agency whose primary role is to provide supplies and services to America's military forces worldwide.

DOD
Department of Defense
The executive department of the government consisting of the Secretary of Defense and his office, the War Council, the Joint Chiefs of Staff, Joint Staff and joint agencies, as well as the Departments of the Army, the Navy and the Air Force.

DOE
Department of Energy
A leading science and technology agency whose research supports our nation's energy security, national security, and environmental quality.

DOG
Deployable Operations Group

DOH
Departmental Overhead
Those expenses incurred internally by an office or a directorate that provides a product or service directly to an external customer.

DRMS
Defense Reutilization and Marketing Services
The agency that disposes of excess property received from the military services. Property that is not reutilized, transferred or donated is sold to the public as surplus.

ECP
Engineering Change Proposal

ED

Directorate of Engineering
The Huntsville Center organization that is responsible for engineering management, planning, facilities and equipment design, and other tasks on a variety of assigned missions. This office addresses all facets of engineering from program inception to completion.

ED & C
Engineering, Design and Construction

EE/CA
Engineering Evaluations/Cost Analysis
A study that evaluates ordnance contaminated sites and recommends appropriate and cost effective response actions.

EEO Officer
Equal Employment Opportunity Officer
A special assistant to the commander, the EEO officer coordinates, monitors, or advises on the EEO and Affirmative Action Programs.

EIS
Environmental Impact Statement
A report required by the National Environmental Policy Act that describes the environmental consequences of proposed actions.

EIT
Engineer-In-Training
Professional certification for engineers.

EMAAR
Engineering Management Automation, Army Reserve
A personal computer-based automated system used by the Army Reserve engineers to provide life cycle management of Reserve facilities from acquisition through disposal.

ENG
Engineering
The application of science and mathematics to structures, products, systems and processes.

EOD
Explosive Ordnance Disposal
The detection, identification, field evaluation, rendering-safe, recovery and final disposal of unexploded explosive ordnance.

EPA
Environmental Protection Agency
The primary environmental policy and enforcement arm of the federal government.

ER
Engineer Regulation
Regulatory guidance published by the Corps of Engineers in numbered publications.

ERG
Executive Review Group
A group of senior Chemical Demilitarization Program managers who meet quarterly with the customer to ensure compliance with requirements on the Chemical Demilitarization Program

ESPC
Energy Savings Performance Contracting
A contracting tool that allows a contractor to provide the design, capital investment, construction, operation and maintenance for new energy efficient equipment or systems, to a government installation at no cost to the government. The contractor is "paid" through the resulting energy cost avoidance savings.

FAR
Federal Acquisition Regulation

FORSCOM
U.S. Army Forces Command
A major Army command responsible for mobilization planning and combat readiness of assigned active Army and Army Reserve units and training supervision of Army National Guard during peacetime; responsible for land defense of the continental U.S.; provides support to civil authorities in domestic emergencies; and provides support to federal, state and local law enforcers to counter flow of illegal drugs.

FTE
Full-Time Equivalent
The number of hours of work that equal one person working full-time for one year.

FUDS
Formerly Used Defense Site
Those properties previously owned, leased or otherwise possessed or used by the Department of Defense for military purposes; or those properties conveyed to a contractor for industrial purposes under an official permit and later legally disposed of.

FWP
Federal Women's Program
A special emphasis program designed to educate the workforce about women's work-related issues operated through the Equal Employment Opportunity Office.

FY
Fiscal Year
The fiscal year for the government is Oct. 1 through Sept. 30.

G&A
General and Administrative Overhead
Those costs, which are not exclusively a part of the work or product such as rent for a building, pay for clerical support and utilities bills.

GIS
Geographic Information System

An integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image and other resources data that is geographically referenced (most data can be related to a map or easily understood graphic); the Huntsville Center OE Directorate uses GIS as technology for ordnance investigations

GPS
Global Positioning System
A worldwide radio-navigation system that uses satellites to determine an exact position anywhere on the earth; the Department of Defense is responsible for the development and maintenance of the system, which was created out of a need to determine exact locations around the world rapidly and reliably; static surveying provides highly accurate data for use in making a calibration or determining coordinates for a base station; GPS is a technology used by the OE directorate for ordnance investigations in surveying and data collection.

HAP
Health Augmentation Program
A health promotion program that allows employees to use up to 3 hours of duty time per week for 26 weeks to participate in an approved fitness program in the Huntsville Center LIFE Center. To oversee the LIFE Center and hold seminars on nutrition, fitness, and other health-related topics, we employ a health professional.

HNC
Huntsville Center
A specialized engineering and support center reporting to the U.S. Army Corps of Engineers.

HQ
Headquarters
The executive and/or administrative elements of a command unit.

HQUSACE
Headquarters, U.S. Army Corps of Engineers
The executive element for the Corps of Engineers located in Washington, D.C.

HR
Human Resources
That portion of personnel management that involves the process of planning, organizing, directing, coordinating and controlling activities designed primarily for their effect on individual morale and organization esprit.

HTRW
Hazardous, Toxic, and Radioactive Waste
Any solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

IDP
Individual Development Plan

Outlines proposed training that would enhance career development for government employees; developed between each individual employee and their supervisor.

IDS
Intrusion Detection System
Electronic security system which Huntsville Center develops criteria for design, construction, procurement and evaluation; assists technical aspects; and in some cases, designs the project.

ILS
Integrated Logistic Support

IM
Directorate of Information Management
The Huntsville Center office responsible for developing policies, plans and procedures, and executing communications (voice and data), automation (including office automation), audio visual information, libraries, records management, publications and printing to support the Huntsville mission.

IMC
Information Management Committee
Senior leaders meet monthly to address IT issues and needs for the Center.

INSCOM
U.S. Army Intelligence Command
One of the U.S. Army's Major Commands; INSCOM's mission is to plan and conduct intelligence, security, and information operations for military commanders and national decision-makers.

IOC
Industrial Operations Command
A major subordinate command of the Army Materiel Command, the IOC commands Army depots, depot activities, arsenals, ammunition plants and other Army industrial activities

IPR
In-progress Reviews
A project review that includes all members of the project team, and evaluates the current and status of project items, and recommends any need actions.

IR
Installation Restoration
Part of the Ordnance and Explosives Directorate's mission, which includes the investigation and cleanup of OE at active military installations; initiated at the parent command's request.

ISO
International Organization for Standards
The organization that developed a set of five individual but related international standards on quality management and quality assurance to help organizations effectively document the quality system elements required to maintain an efficient quality system. The standards, published in 1987, are not specific to any particular industry, product or service

KO
Contracting Officer
The government employee authorized to direct and implement government contract changes and modifications.

LAN
Local Area Network
The computer system that facilitates the exchange of electronic information, files, data, etc., internally (or locally).

LCPM
Life Cycle Project Manager
Used in conjunction with Ordnance and Explosives projects, it refers to the district responsible for project management of OE projects in its geographic area; Huntsville Center as the Center of Expertise and Technical Manager, while the Life Cycle Manager is responsible for determining project sites, funding, public affairs, coordination with other agencies/parties, and overall project management.

LDP
Leadership Development Program
Huntsville Center program that encourages and facilitates the development of supervisory skills to non-supervisory employees by providing guidance, mentoring and training for leadership development.

LIR
Line Item Review
A project review of budget and schedule issues involving all team members.

LM
Directorate of Logistics Management
The Huntsville Center office responsible for supply management, accountable property management, stock control procedures, office supplies, inventory, government vehicles and related property/transportation issues in support of the Huntsville mission.

MACOM
Major Commands
The U.S. Army's first division and layer of responsibility among its troops; the U.S. Army Corps of Engineers is one of fifteen of the Army's Major Commands.

MCA
Military Construction, Army
A Corps of Engineers designation for project support and funding that separates and prioritizes missions separately from civil works support.

MCCDC
Marine Corps Combat Development Center

MCG
Management Coordination Group

Senior leaders meet weekly to review the adequacy of resources to meet customers needs, to develop new service areas, and to ensure alignment of processes and resources.

MCP
Management control process
Senior leaders use the annual MCP to evaluate critical controls, thereby determining weaknesses in management systems and regulatory compliance and taking corrective action.

MCX
Mandatory Center of Expertise
Corps of Engineers' designation to a division, district or center that requires any Corps project issue that falls under the MCX to be referred to that office.

MEDCOM
Medical Command
One of the U.S. Army's Major Commands; MEDCOM's mission is to provide direction and planning for the Army Medical Department in conjunction with the Surgeon General, and to develop and integrate doctrine, training, leader development, organization, and materiel for Army health services.

MIPR
Military Interdepartmental Purchase Request
An Army form/actions that officially authorizes the transfer of funds from one entity to another.

MOA
Memorandum of Agreement
An official recognition of a special relationship/support between Army entities.

MRD
Missouri River Division
One of the Corps of Engineers' subordinate commands that oversees districts and their missions in the Missouri River area.

MVD
Mississippi Valley Division
One of the Corps of Engineers' subordinate commands that oversees districts and their missions in the Mississippi Valley area.

NAD
North Atlantic Division
One of the Corps of Engineers' subordinate commands that oversees districts and their missions in the North East area.

NASA
National Aeronautics and Space Administration
The government agency responsible for administering and managing the U.S. space program.

NCMA
National Contract Management Association
A national professional society that focuses on contract management issues.

NCP
National Contingency Plan
The Federal regulation that guides the Superfund program.

NGB
National Guard Bureau
The agency that develops and administers programs for Army and Air National Guard units and is the primary communications channel between the states and the Departments of Army and the Air Force.

NPR
National Performance Review
The national partnership for reinventing government is a Clinton/Gore administration's initiative to reform the way the federal government works by creating a government that works better and costs less.

OC
Office of Counsel
The Huntsville Center office responsible for counseling and rendering legal advice and assistance to the Commander, Deputy Commander, Contracting Officers and their staffs in support of the Huntsville mission.

OCAR
Office of the Chief, Army Reserve
The office that serves as the headquarters and managers the U.S. Army Reserve.

OE
Ordnance and Explosives
The Huntsville Center Directorate responsible for managing the U.S. Army Corps of Engineers' Formerly Used Defense Site Program, which is designed to investigate and clean up ordnance and explosives on sites once used or owned by the by the Department of Defense; also responsible for developing guidelines and procedures for ordnance projects to include such issues as risk assessments, safety, transportation, storage, etc.

O&M
Operation and Maintenance
Funding, facilities, equipment and personnel used to support the sustained operation of a government facility.

OMEE
Operation and Maintenance Engineering Enhancements
Huntsville Center program that provides an engineering approach to the enhancement of the operation and maintenance (O&M) of both newly constructed and existing government facilities.

OSD
Office of the Secretary of Defense
The Secretary of Defense and his staff who are responsible for overseeing and managing the operations of the Department of Defense.

OSHA
Occupational Safety and Health Agency
The federal agency responsible for developing and monitoring safety regulations for government and industry.

P&PM
Program & Project Management
The Huntsville Center office responsible for planning, programming, managing, coordinating, directing, controlling and executing of programs and projects in support of the Huntsville mission.

PA
Programmed Amount
Funding projected and requested for a project or program based on estimated costs.

PAO
Public Affairs Office
The Huntsville Center office responsible for planning, developing and managing public information, command information and community relations in support of the Huntsville mission.

PAT
Process Action Team
Team that works on a specific improvement project and are composed of people who are involved in the process being studied.

PAX
Programming, Administration, and Execution

PBS
Production Base Support
Former Huntsville Center program which upgraded, expanded and modernized the Army munitions production base.

PE
Professional Engineer
Professional certification for engineers.

PIP
Public Involvement Plan
A project plan designed to identify the public affected by a project, and identify the means through which to communicate information to that public.

PL
Public Law
Law enacted through Congress.

PM
Project Manager/Project Management

Responsible for overseeing and developing plans, manpower, costs, schedules, and tasks for a project; provides leadership and serves as the point of contact with the customer, regulatory agencies and other activities.

PMCD
Program Manager for Chemical Demilitarization
The Army organization authorized by Congress to oversee and manage the Army's Chemical Demilitarization Program.

PMP
Project Management Plan
The plan that outlines the tasks, manpower, costs and schedules for a project.

PQA
President's Quality Award
An award developed by the government's Office of Personnel management to recognize government agencies' efforts to improve customer service and save tax dollars; the standards for the award are based on international business practices and similar awards that recognize private industries in their efforts to improve customer service and cut costs.

POC
Point of Contact
A person designated to be contacted regarding a specific issue.

POD
Pacific Ocean Division
One of the U.S. Army Corps of Engineers' subordinate commands responsible for missions in the Pacific Ocean area.

PR&A
Program Review and Analysis

PRAC
Program Resource Advisory Council
Reviews and allocates funds and manpower; resolves budget issues; reviews and approves program and internal operating budgets. Used for resource planning reports to HQUSACE

PRB
Project Review Board

PROMIS
Project Management Information System
The system used to monitor budgets and schedules. PROMIS is a corporate system accessible via desktop computers to all workers needing data

QA
Quality Assurance
Review of a process or project that ensures that quality, regulations and standards that pertain to it are met.

QA/QC
Quality Assurance/Quality Control
The review of a process or project that ensures that quality, regulations and standards that to it are met, while simultaneously monitoring for the same elements.

QAT
Quality Assessment Team

QC
Quality Coordinator

QCP
Quality Control Plan

QMB
Quality Management Board
A permanent cross-functional team made up of top and mid-level managers who are jointly responsible for a specific product, service or process; the structure of the board is intended to improve communication and cooperation by providing vertical and horizontal "links" throughout the organization.

QSG
Quality Steering Group

RAB
Restoration Advisory Board
Initiated by the Defense Environmental Restoration Plan, the Restoration Advisory Board is an advisory committee for DOD environmental projects comprised of representatives from the Department of Defense, involved regulators, installations, local governments and stakeholders; the RAB is a forum to discuss and exchange information about the program and project, and it gives stakeholders the opportunity to participate in the environmental cleanup process and make their views known to decision makers.

RAM
Reliability, Availability, and Maintainability

RCRA
Resource Conservation and Recovery Act
A Federal law that established a regulatory system to transport hazardous substances from their generation to disposal; the law requires safe and secure procedures to be used in treating, transporting, storing and disposing of hazardous substances; RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

RFP
Request for Proposal
Contracting initiative that solicits contractor proposals for a specific job/contract.

RM
Directorate of Resource Management

The Huntsville Center office responsible for assisting the Commander and members of his staff with the maintenance of balance, economy and efficiency in the accomplishment of the Huntsville Center mission.

RMS
Resident Management System

RTLP
Range and Training Land Program
A Huntsville Center program that provides up-to-date range design and construction knowledge; the Huntsville Center provides a centralized point of contact for range design and construction issues, and maintains standard design drawings and manuals for all the Army's automated ranges; the RTLP is part of the Army force modernization effort, which is a long term program to modernize and upgrade installation live fire training ranges and training land to accommodate the increased lethality and maneuverability of modern weapons systems, the advances in soldier training philosophy, and the rapid technological growth associated with the computer age.

S&A
Supervisory and Administrative
The Huntsville Center account that funds supervisory and administrative activities.

SAACONS
Standard Army Automated Contracting System)
The system that automates data related to acquisitions, contract performance, and acquisition tracking.

SAD
South Atlantic Division
The U.S. Army Corps of Engineers subordinate command responsible for missions in the South Atlantic region of the U.S.

SAME
Society of American Military Engineers
A private professional society that focuses on engineering and business issues as related to the military, government, and private industry.

SARA
Superfund Amendments and Reauthorization Act
The modification to CERCLA enacted in 1986 that made CERCLA applicable to Federal agencies.

SARDA
Secretary of the Army, Research, Development and Acquisition
The Army office that manages the acquisition and directs the research and development activities of the Department of the Army, and manages the procurement, contracting and related function of the Army.

SL
Office of Security and Law Enforcement

The Huntsville Center office serves as staff advisor to the Commander and technical consultant to command staff elements regarding security practices and procedures, and maintains liaison with military and civilian local, county, state, and national law enforcement agencies.

SOP
Standing Operating Procedure
A set of instructions covering those features of operations which lend themselves to a definite or standardized procedure without loss of effectiveness; the procedure is applicable unless ordered otherwise.

SOW
Statement of Work
Contract summary that outlines the contractor's required responsibilities.

SPD
South Pacific Division
The U.S. Army Corps of Engineers' subordinate command responsible for missions in the south pacific region of the United States.

SSCASS
One of several electronic systems for supplier evaluation. They are corporate databases accessible via desktop computers to all workers needing data

SWD
Southwestern Division
The U.S Army Corps of Engineers' subordinate command responsible for missions in the southwestern region of the United States.

SWOT
Strengths, Weaknesses, Obstacles, and Threats

TEB
Technical Evaluation Board

TAPES
Total Army Personnel Evaluation System
The performance rating system used for all federal government employees.

TLM
Total Labor Multiplier
A measure of cost effectiveness and competitiveness, TLM is a factor used to convert a base hourly labor rate to what is called a "loaded" hourly labor rate; the loaded hourly labor rate is the rate billed to Huntsville Center customers; TLM includes the cost of fringe benefits, and departmental as well as general and administrative overhead expense but does not include direct non-labor expenses.

TM
Technical Manager

One of Huntsville Center's primary functions; provide technical expertise in the development, design, management and coordination of projects, to include managing and planning the technical efforts of contractors and ensuring accurate and quality products and resolutions of technical issues.

TQM
Total Quality Management
A comprehensive, structured, disciplined system for improving work processes; it is structure to ensure internal and external customer requirements are understood and satisfied and continuous process improvement is institutionalized; the intent of implementation is to simultaneously improve quality and increase productivity; correctly implementing translates directly into continuously improving training, unit readiness, and combat effectiveness; applies to every organization soldier and Army civilian.

TRACES
Tri-Services Automated Cost Engineering System
A standard automatic data processing system to support the preparation, maintenance, and evaluation of computerized cost estimates; the MCACES module (which supports the development and maintenance of detailed cost estimates) was developed by Huntsville Center and was the basis for TRACES.

TRADOC
Training and Doctrine Command
One of the major commands of the U.S. Army; TRADOC's mission is to serve as the architect for the 21st century Army, while ensuring that the Army is prepared to fight through training, doctrine and combat developments.

UMCS
Utility Monitoring and Control System
A Huntsville Center program that was developed in response to recurring problems in the design and installation of Utility Monitoring Control Systems throughout the Department of Defense, Huntsville Center is responsible for: developing and maintaining Utility Monitoring Control Systems/Electronic Monitoring Control Systems criteria and guidance; reviewing all designs and procurement packages; providing technical assistance during design and construction; and participating in all factory and field tests.

USACE
United States Army Corps of Engineers
One of the major commands of the U.S. Army; the Corps' mission is to provide engineering, construction management and environmental services in peace and war.

USARC
United States Army Reserve Command
A major subordinate command of FORSCOM, USARC's mission is to command, control support and ensure wartime readiness of USAR forces; USAR also organizes, trains, prepares and supports USAR unit for mobilization, and manages and executes allocated Army Reserve personnel funding, and operations and maintenance funding.

USMC
United States Marine Corps

The U.S. Navy's amphibious fighting force that serves on shipboard or in close association with the naval force.

USATCES
U.S. Army Technical Center for Explosive Safety
Army organization that oversees technical and safety issues for Army ordnance projects located at McAlester Army Ammunition Plant, McAlester, Okla.

UXO
Unexploded Ordnance
An item of ordnance that has failed to function as designed, or has been abandoned or discarded and is still capable of functioning and causing injury to personnel or materiel; the Huntsville Center OE Directorate mission is to reduce the risk of UXO at Formerly Used Defense Sites, Base Realignment and Closures, and active installations.

VE
Value Engineering
Studies and methods that enhance engineering projects by achieving the lowest total cost consistent with requirements for performance, reliability, quality and maintainability; as a unique engineering center for the Corps, one of the primary functions of Huntsville Center is to apply value engineering to its projects.

VTC
Video-Teleconferencing Center
Allows live conference calls (video image and audio) between various personnel at long distance locations.